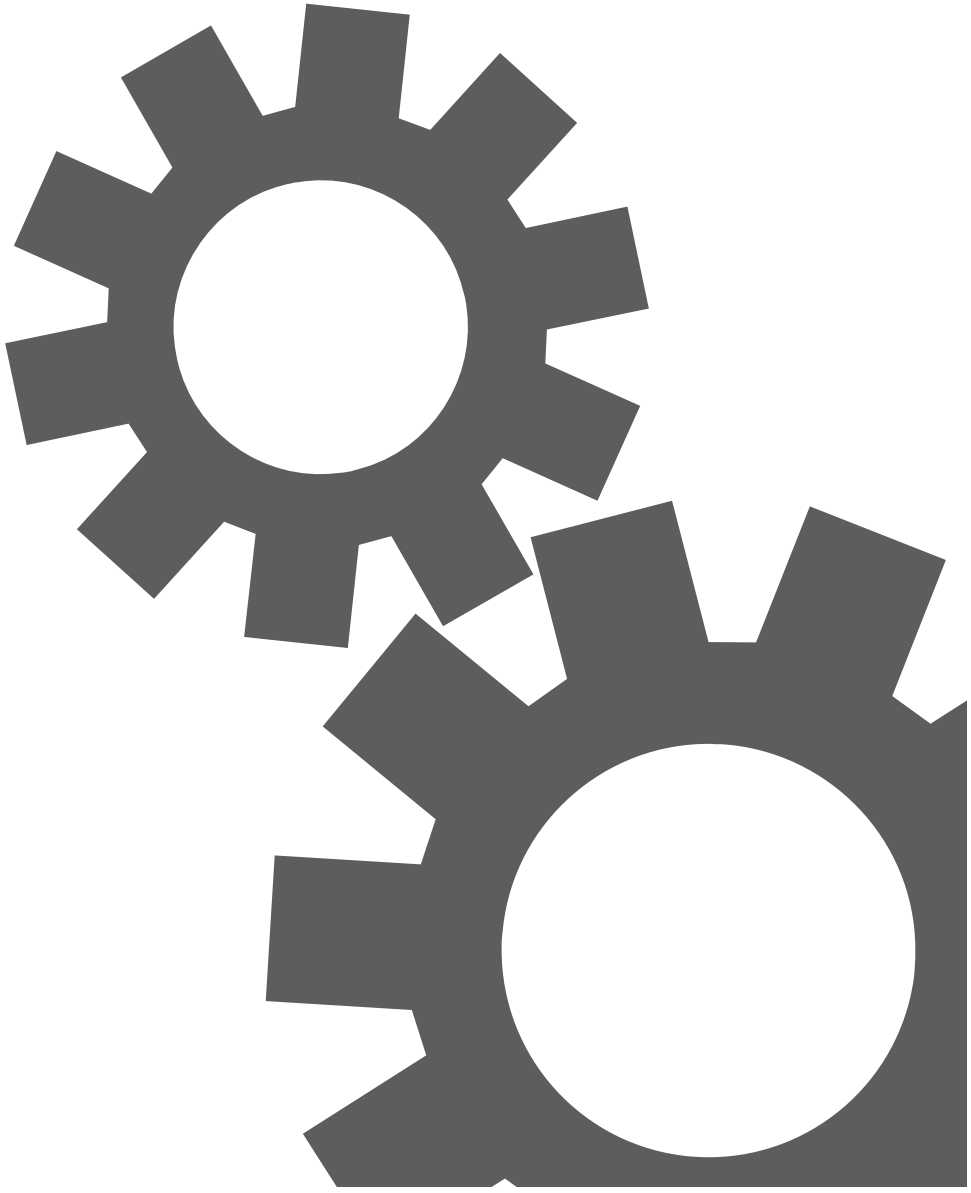
HSD
MECHATRONIC
DIVISION

Translation of the original instructions

Electrospindle ES748, ES750

User Manual



Edition.Revision 1.1
H5801H0083 ENGLISH
Serial number

Information about the publication

Code	Issue	Code of previous issue
H5801H0083	1	

Revision	Description of updates
0 (11/2011)	new document
1 (06/2012)	General revision

This manual has been prepared for use by customers only, and contains information protected by copyright. It must not be photocopied or reproduced in any form, either fully or in part, without the prior written consent of the manufacturer.

HSD S.p.A. © - H5801H0083.fm051112

Index

1 Preliminary information

1.1 Documents supplied with the product 7
1.2 Scope of the manual 7
1.3 Symbols used in the manual 8
1.4 Risks associated with the use of the product 8
1.5 Product Information 10
1.6 Glossary 11
1.7 Warranty 12

2 Technical Specifications

2.1 Description of main parts: ES748 13
2.2 Description of main parts: ES750 14
2.3 Characteristics and performance 16

3 Transport, packing, unpacking, storage

3.1 Warnings 21
3.2 Dimensions and weights 21
3.3 Transport and packing conditions 21
3.4 Unpacking 22
3.5 Storage 23

4 Installation and commissioning

4.1 Preliminary installation checks 25
4.2 Preparing the factory services 25
4.3 Mechanical connections 26
4.4 Specifications for the compressed air supplied to the manufacturer's products 27
4.5 Example diagrams for pneumatic circuits by the customer 29
4.6 ES748 and ES750 connections for air cylinder 31
4.7 ES750 connections for Oil cylinder 32
4.8 Internal pressurisation 32
4.9 Refrigerator 33
4.10 Tool cooling 34
4.11 Example diagram of the cone's cleaning circuit 35
4.12 Electrical connections 36

5 General post-installation checks

5.1 Electrospindle pre-startup checks 39
5.2 First start-up checks 41

6 Use and adjustment

6.1 Environmental conditions 43
6.2 Running-in 43
6.3 Warm-up 43
6.4 Collet 44
6.5 Tool holder cone 44
6.6 Tool 45
6.7 Fluids distributor 46
6.8 Procedure to follow if the tool becomes jammed in the piece being machined 47
6.9 Sensors 48
6.10 Encoder 52

7 Programmed maintenance

7.1 Daily maintenance 62
7.2 Biweekly maintenance 64
7.3 Bearings 64

8 Replacing components

8.1 Replacement and adjustment of the sensor unit 66

9 Disposal of the product

10 Troubleshooting

11 List of spare parts

12 Assistance

13 Declaration of incorporation

HSD S.p.A. © - H5801H0083TOC.fm051112

1 Preliminary information

1.1 Documents supplied with the product

The following documents are supplied together with the product:

- Declaration of incorporation as provided for by Appendix IIB of Directive 2006/42/EC
- Product test certificate
- This manual, containing warnings and instructions for the transport, installation, use, maintenance and disposal of the product

i Check that all the documents listed above are present on delivery of the product. If necessary, further copies can be obtained on request from the manufacturer.

1.2 Scope of the manual

The manual forms an integral part of the product and as such must accompany it at all times, otherwise the product will be lacking in one of its primary safety requirements.

The manual must be well taken care of, distributed and made available to all personnel involved.

The purpose of the warnings contained in the manual is to safeguard the health and safety of personnel exposed to residual risks.

The manual provides information on the most appropriate behaviour to adopt for the correct use of the product as provided for by the manufacturer.

In the case where the information contained in the manual conflicts with health and safety standards, contact the manufacturer to request the necessary corrections and/or adaptations.

In order to prevent incorrect operation that could constitute a hazard for personnel and/or cause damage to the product, all the documents supplied with the product must be read and fully understood.

The manual must be stored in an appropriate location and must always be readily available for consultation.

i The information contained in the manual is indispensable for using the product in a safe and correct manner for the purposes for which it has been designed.

1.3 Symbols used in the manual

Danger
Indicates a procedure, practice or similar action that could cause injury if not respected or carried out correctly.

Caution
Indicates an operating procedure, practice or similar action that could damage or completely destroy the product if not respected or carried out correctly.

Information
Highlights particularly important information of a general nature that must not be ignored.

1.4 Risks associated with the use of the product

The manufacturer is not aware and cannot be aware of how the product will be installed. Consequently, the installer or final user must perform a risk analysis relating specifically to the type of installation and the methods adopted.

It is nevertheless the responsibility of the installer to ensure that there is adequate protection against risks of accidental contact with moving parts.

The installer and user must also take into account the possible presence of other types of risk, in particular that deriving from the entry of foreign bodies and the use of explosive, flammable, toxic or hot gases.

Consideration should also be given to risks inherent to maintenance operations, which must be carried out under conditions of maximum safety by ensuring that the product is isolated and at a complete standstill.

An overall risk analysis must be carried out on the completed machine on which the manufacturer's product will be installed. A conformity declaration must then be issued in line with Appendix IIA of directive 2006/42/EC and its subsequent amendments.

The product must not be put into service until the machine in which it has been incorporated has been made to comply with the requirements of Directive 2006/42/EC and its subsequent amendments.

1.4.1 Risks associated with improper handling and/or use

It is absolutely forbidden to bypass, remove, modify or render inoperative any safety devices, controls or guards protecting individual parts or the product as a whole.

- Never place hands, arms or any other parts of the body near to moving parts.
- The product must not be used in environments where there is an explosion risk .
- The elimination of faults or anomalies in the operation of the product or modifications to the type of operation or installation must not be carried out by unauthorised personnel.

HSD S.p.A. © - 0101h00a.fm051112

- On completion of any extraordinary maintenance involving the removal of guards, barriers or other safety devices, these must be replaced before starting the product, making sure that they are positioned correctly and in full working order.
- All guards and safety devices must be maintained efficient and in perfect condition. Warning and danger signs and symbols must be clearly legible and must never be removed.
- When performing troubleshooting operation on the product, take all the necessary precautions described in the Instruction Manual to prevent damage or injury.
- Remember to tighten all screws, nuts and locking rings of each mechanical component that has been adjusted or set-up.
- Before starting the product, make sure that all the safety devices are installed and in perfect working order. If this is not the case, under no circumstances must the product be started, instead inform the works safety manager or the department head.
- The operator must be provided with Personal Protection Equipment (PPE) as provided for by current legislation. Loose bulky clothing and accessories (ties, wide sleeves, etc.) must not be worn

1.4.2 Risks specific to product maintenance

⚠ **In order to be able to work in complete safety on a product already installed on a machine, refer to the machine's instruction manual.**

- Isolate the product from the mains power supply before proceeding with any maintenance operations!
- Even though the product has been disconnected from the mains power supply, the rotating and mobile parts may still be in motion due to inertia. Therefore, prior to carrying out any maintenance operations, make sure that the rotating and mobile parts of the product are stationary.

1.4.3 Residual risks

The product has been analysed in compliance with Directive 2006/42/EC in order to identify possible risk sources. The risks that remain (residual risks) and the relative countermeasures are highlighted in the relative sections of this manual.

1.5 Product Information

1.5.1 Purpose of the product

The product cannot function on its own: it is a machine component designed to be assembled with other machine parts or incorporated in machinery in order to constitute a machine as provided for by Directive 2006/42/EC.

The product must not be put into service until the machine in which it has been incorporated has been made to comply with the requirements of Directive 2006/42/EC and its subsequent amendments.

1.5.2 Identification of the product and manufacturer

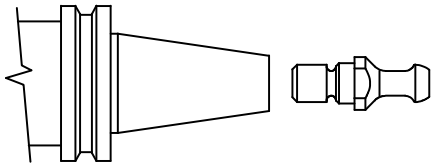
The serial number represents the only means recognised by the manufacturer of identifying the product. The product user is responsible for ensuring that the serial number remains intact.

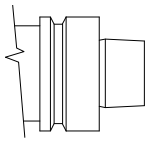
The position of the product serial number is shown in chapter 2 “Technical Specifications” .

i An adhesive is applied to the product bearing the address of the registered offices of the manufacturer.

HSD S.p.A. © - 0101h00a.fm051112

1.6 Glossary

<table>
<tr><td rowspan="2">ISO</td><td colspan="2">  </td><td rowspan="2">Tool holder cone locking system as described in standard DIN 69871.

A plate similar to that shown alongside is fixed to the electrospindle to indicate the type of locking system.</td></tr>
<tr><td>CONE ISO DIN 69871</td><td>SCREW
DOWEL
FNAG051082</td></tr>
<tr><td rowspan="2">HSK</td><td>  </td><td colspan="2" rowspan="2">Tool-holder cone connection system, described in standard DIN 69893.

The electrospindle carries a plate similar to the one shown alongside, indicating the type of connection.</td></tr>
<tr><td>HSK - DIN 69893 CONE</td></tr>
<tr><td>Dynamic balance quality grade</td><td colspan="3">The balance quality of a rotating object according to standard ISO 1940/1, indicated by the letter G. Low G values indicate better balancing. G=0.4 indicates maximum balancing precision. G assumes discrete values in multiples of 2.5 (G=0.4 G=1 G=2.5 …).</td></tr>
<tr><td>Rated voltage</td><td colspan="3">Maximum power supply voltage.</td></tr>
<tr><td>Rated frequency</td><td colspan="3">Minimum frequency at which the maximum power supply voltage is provided.</td></tr>
<tr><td>Rated characteristics</td><td colspan="3">The set of nominal values reached at rated frequency.</td></tr>
<tr><td>Service type S1</td><td colspan="3">Operation at constant load with a duration sufficient to ensure that the motor reaches thermal equilibrium.
Abbreviated to S1.
(Standard CEI EN 60034-1)</td></tr>
<tr><td>Service type S6</td><td colspan="3">A sequence of identical operating cycles, each consisting of a period of operation at constant load and a period of operation with no load, with constant rpm and without any intermediate rest times.
Abbreviated to S6, followed by the percentage ratio between the period of operation under load and the duration of one cycle.
For example: S6 40%
(40% operating time under load, 60% operating time without load)
(standard CEI EN 60034-1)</td></tr>
</table>

Torque and power	$C(Nm) = \frac{(60xW)}{2x\pi xrpm}$	**C** = torque **W** = power **rpm** = revolutions per minute
	The precise definition of torque and power is beyond the scope of this manual. Nevertheless, it can be said that torque is the force with which the tool bites into the work piece (and for the same torque, the force increases as the diameter of the tool decreases). Power, instead, is proportional to the torque and speed of rotation and, as such, determines the maximum machining speed (in line with tool performance, characteristics of the material being machined and the type of machining).	
Coolant	Fluid, liquid or gas (including air) used to transfer heat from the spindle to the environment.	
Scheduled maintenance	A series of activities required to maintain the condition and operation of the product the same as that provided for by the manufacturer at the moment of its introduction onto the market. The maintenance is carried out by means of programmed adjustments, repairs, part replacements, etc..	

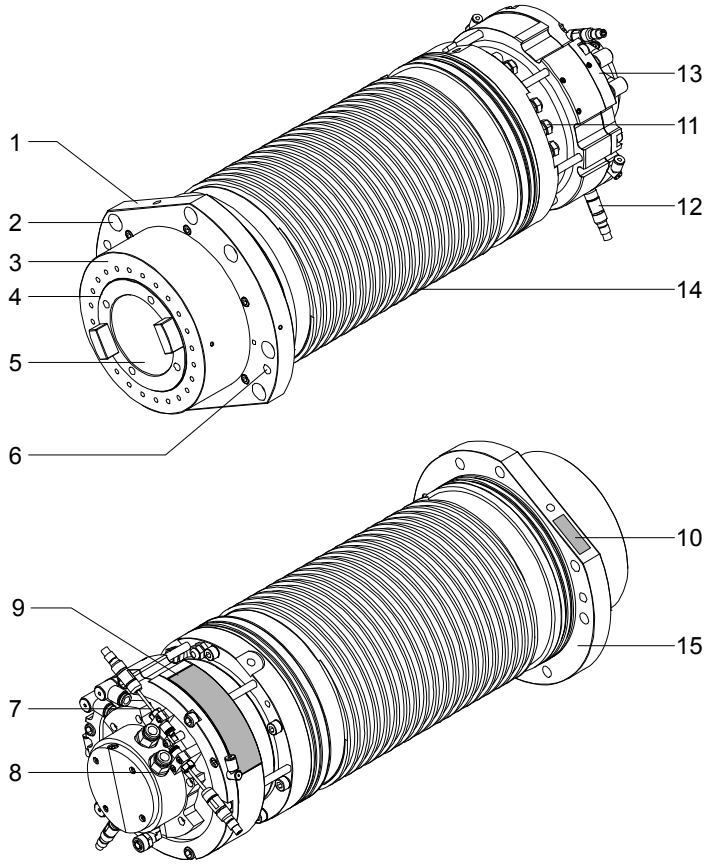
1.7 Warranty

For information about the warranty, please refer to the documentation issued on purchase of the machine.

HSD S.p.A. © - 0101h00a.fm051112

2 Technical Specifications

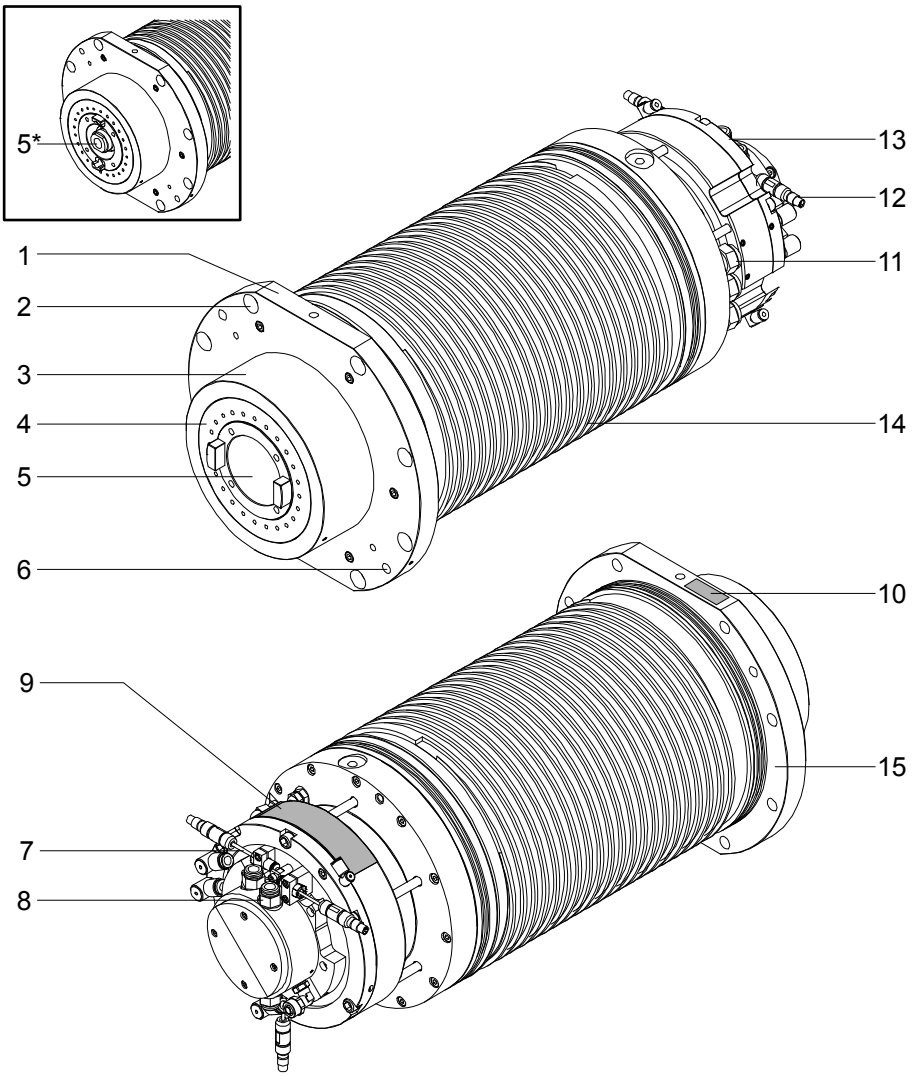
2.1 Description of main parts: ES748



1	Front flange	**7**	Sensors	**13**	Cylinder
2	8 fixing holes Ø12,5	**8**	Pneumatic connectors	**14**	Spiral casing
3	Nose	**9**	EC plate	**15**	Fixing surface
4	Pressurisation labyrinth	**10**	Serial number		
5	ISO coupling	**11**	Passage of power cables with connector		
6	2 holes M12 for extraction	**12**	Sensor connectors		

2.2 Description of main parts: ES750

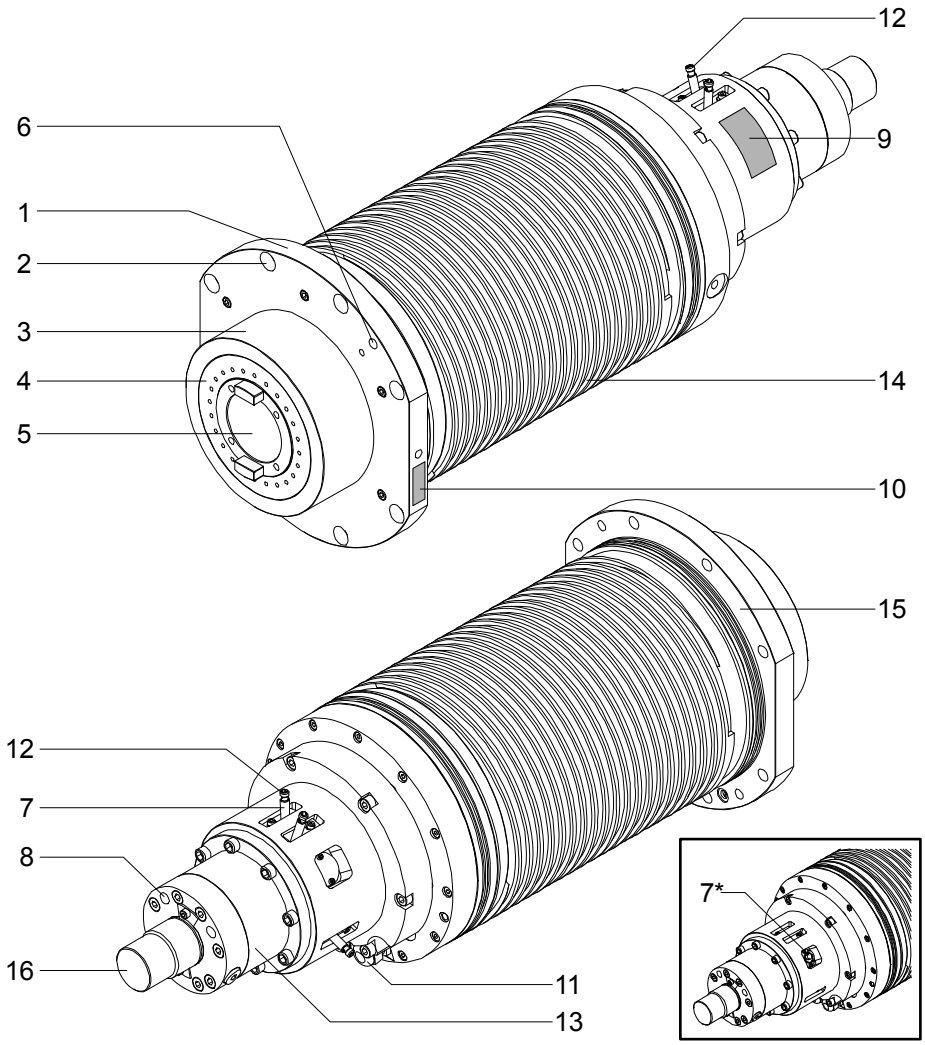
2.2.1 Air piston version



1	Front flange	**6**	2 holes M12 for extraction	**12**	Sensor connectors
2	8 fixing holes Ø12,5	**7**	Sensors	**13**	Cylinder
3	Nose	**8**	Pneumatic connectors	**14**	Spiral casing
4	Pressurisation labyrinth	**9**	EC plate	**15**	Fixing surface
5	ISO coupling	**10**	Serial number		
5*	HSK connecting device	**11**	Passage of power cables with connector		

HSD S.p.A. © - 0102h00a.fm051112

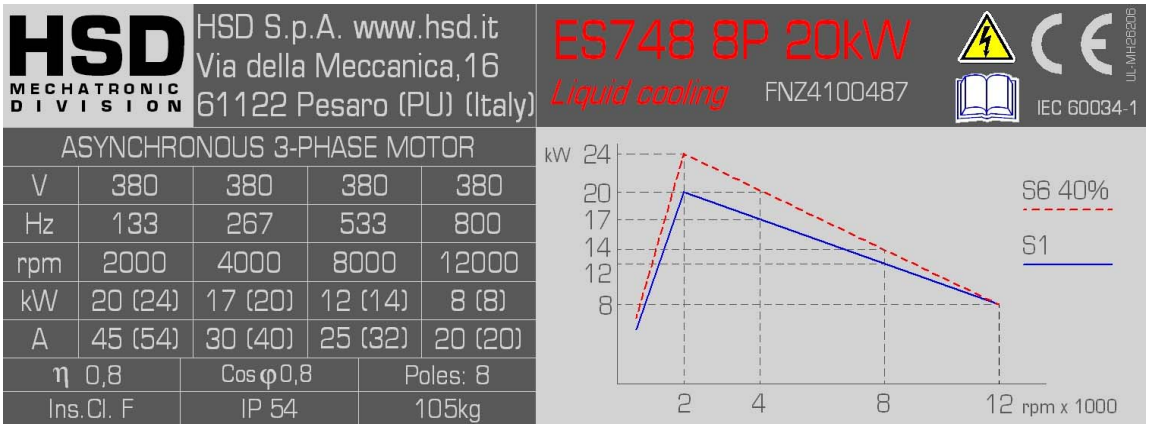
2.2.2 Oil piston version



1	Front flange	**7**	Sensors	**12**	Sensor connectors
2	8 fixing holes Ø12,5	**7***	Analogue sensor	**13**	Cylinder
3	Nose	**8**	Hydraulic connections	**14**	Spiral casing
4	Pressurisation labyrinth	**9**	EC plate	**15**	Fixing surface
5	ISO coupling	**10**	Serial number	**16**	Fluids distributor
6	2 holes M12 for extraction	**11**	Passage of power cables with connector		

2.3 Characteristics and performance

2.3.1 ES748



FNZ4100487 Rev.00 (SP 150.110.62)

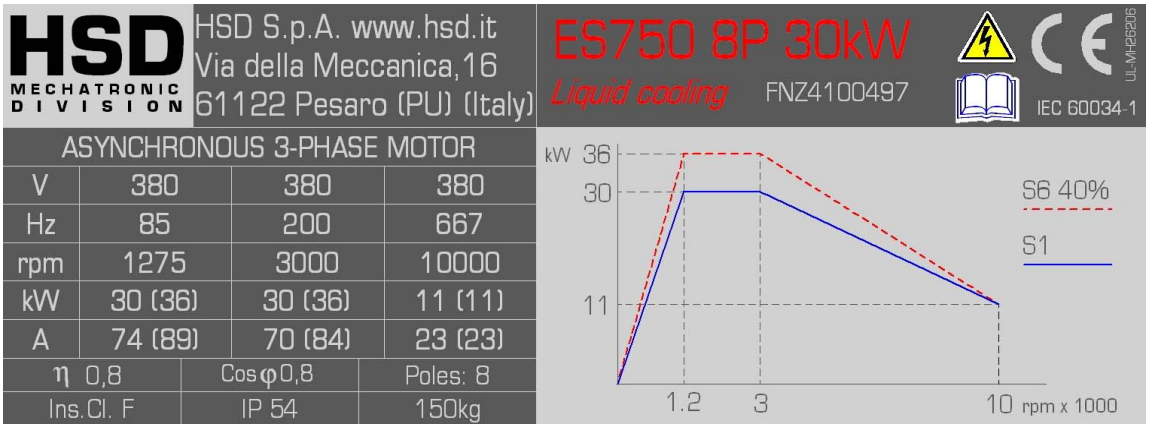
Nominal voltage (supplied by inverter)	V	380		380		380		380	
Rated frequency	Hz	133		267		533		800	
Rated speed	rpm	2000		4000		8000		12000	
Duty type		S1 cont	S6 40%	S1 cont	S6 40%	S1 cont	S6 40%	S1 cont	S6 40%
Rated power	kW	20	24	17	20	12	14	8	8
Rated torque	Nm	95.4	114.5	40.5	47.7	14.3	16.7	6.4	6.4
Rated current	A	45	54	30	40	25	32	20	20
Rated efficiency η		0.8							
Power factor cos φ		0.8							
Number of poles		8							
Insulation class		F							
Class IP		54							
Cooling type		Liquid cooling							
Weight	kg	~ 105							

The maximum rated current "S1/cont" is used to set the "maximum continuous current" parameter of the inverter.

Parameters of the equivalent electrical network

Description	unit of measurement	Value
Nominal power (S1)	kW	20
Nominal current (S1)	A	45
Nominal line voltage	V	380
Nominal speed at nominal load	rpm	1995
Rated frequency	Hz	133
No-load line voltage	V	366
No-load current	A	26.3
Stator resistance (20°C)	Ω	0.206
Rotor resistance (20°C)	Ω	0.138
Stator dispersion reactance	Ω	0.682
Stator dispersion inductance	mH	0.82
Rotor dispersion reactance	Ω	0.32
Rotor dispersion inductance	mH	0.38
Main field reactance	Ω	0.901
Main field inductance	mH	1.08
Field weakening start speed	rpm	2000
Maximum motor speed	rpm	12000
Power factor		0.80
Rotor moment of inertia	Kg m^2	6.57E-02
Connection	Y or D	Y

2.3.2 ES750



FNZ4100497 Rev.00 (SP 150.110.62)

Nominal voltage (supplied by inverter)	V	380		380		380	
Rated frequency	Hz	85		200		667	
Rated speed	rpm	1275		3000		10000	
Duty type		S1 cont	S6 40%	S1 cont	S6 40%	S1 cont	S6 40%
Rated power	kW	30	36	30	36	11	11
Rated torque	Nm	224	269	95.5	114.6	10.5	10.5
Rated current	A	74	89	70	84	23	23
Rated efficiency η		0.8					
Power factor cos φ		0.8					
Number of poles		8					
Insulation class		F					
Class IP		54					
Cooling type		Liquid cooling					
Weight	kg	~ 150					

The maximum rated current "S1/cont" is used to set the "maximum continuous current" parameter of the inverter.

HSD S.p.A. © - 0102h00a.fm051112

Parameters of the equivalent electrical network

Description	unit of measurement	Value
Nominal power (S1)	kW	30
Nominal current (S1)	A	74
Nominal line voltage	V	380
Nominal speed at nominal load	rpm	1211
Rated frequency	Hz	85
No-load line voltage	V	373
No-load current	A	61
Stator resistance (20°C)	Ω	0.218
Rotor resistance (20°C)	Ω	0.19
Stator dispersion reactance	Ω	0.572
Stator dispersion inductance	mH	1.1
Rotor dispersion reactance	Ω	0.217
Rotor dispersion inductance	mH	0.41
Main field reactance	Ω	3.063
Main field inductance	mH	5.7
Field weakening start speed	rpm	1275
Maximum motor speed	rpm	10000
Power factor		0.8
Rotor moment of inertia	Kg m^2	1.32E-01
Connection	Y or D	Y

HSD S.p.A. © - 0102h00a.fm051112

3 Transport, packing, unpacking, storage

3.1 Warnings

- Product lifting and handling operations can create hazardous situations for the personnel involved. Therefore, it is advisable to follow the instructions supplied by the manufacturer and to use the appropriate equipment.
- The installation and assembly operations must always be carried out by specialised technicians only.
- All the lifting and handling operations of the product and its parts must be performed with extreme care, avoiding impacts that could compromise its operation or damage any coated parts.

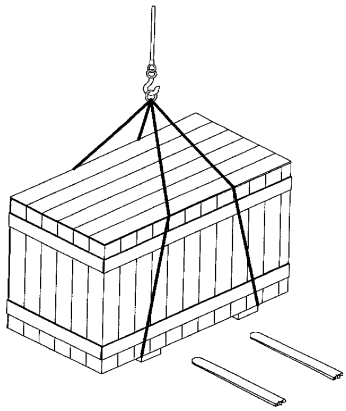
The user is responsible for selecting the lifting equipment (cables, straps or chains, etc.) regarded as most suitable in terms of operation and capacity with respect to the weight of the load indicated on the packing and on the product label.

3.2 Dimensions and weights

- Weight of the packed product: this is reported on the packing.
- Linear dimensions of the packed product: these are reported in the documents accompanying the product.

3.3 Transport and packing conditions

The product is shipped protected by a VCI plastic wrapping and expanded foam, and packed in a wooden case or in a special cardboard box.
The following figure illustrates methods that can be used to lift the case using cables and a forklift. In the case of a forklift, make sure that the centre of gravity of the case is between the forks when lifting.



The examples shown are for information purposes only, in that it is not possible for the manufacturer to determine all the possible configurations for lifting its products beforehand.

3.4 Unpacking

Prior to opening the packing, make sure that the seals are still intact.

If the product is delivered in a wooden case, insert a screwdriver under the fastener. Use the screwdriver as a lever, taking care not to damage the case or its contents.

If the product is packed in a cardboard box, remove the strips of adhesive tape, taking care not to damage the box or its contents.

The expanded foam and plastic wrapping must be disposed of as plastic material.

HSD S.p.A. © - 0103h00a.fm051112

3.5 Storage

If the product is to be placed in storage, it must be protected against weather, humidity, dust and aggressive atmospheric and environmental agents.

It is therefore necessary to:

- carry out periodic checks to ascertain the general storage condition of the product
- Manually rotate the shaft approximately once a month to make sure that the bearings remain perfectly greased.

STORAGE TEMPERATURE: from +5°C (+41°F) to +55°C (+131°F)

RELATIVE HUMIDITY WITHOUT CONDENSATION: from 5% to 55%

HSD S.p.A. © - 0103h00a.fm051112

4 Installation and commissioning

4.1 Preliminary installation checks

Before carrying out any operations, MAKE SURE:

- that no part of the electrospindle has been damaged by impact or any other cause during transport and/or handling;
- that the connectors are undamaged.

4.2 Preparing the factory services

It is the responsibility of the customer to ensure the availability of the factory services (e.g. electricity supply, compressed air supply, etc.).
The electricity supply line of the electrospindle must have a sufficient power rating. The connection to the mains electricity supply must be carried out by a qualified electrician.

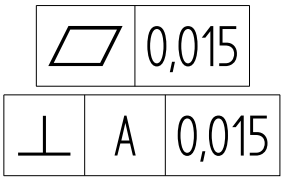
The customer is responsible for the entire power supply system to the product as far as the connectors.
The user must guarantee all the safety conditions necessary for "earthing" the electrospindle.
The earthing system must comply with current standards in the country of installation and must be checked regularly by qualified personnel.

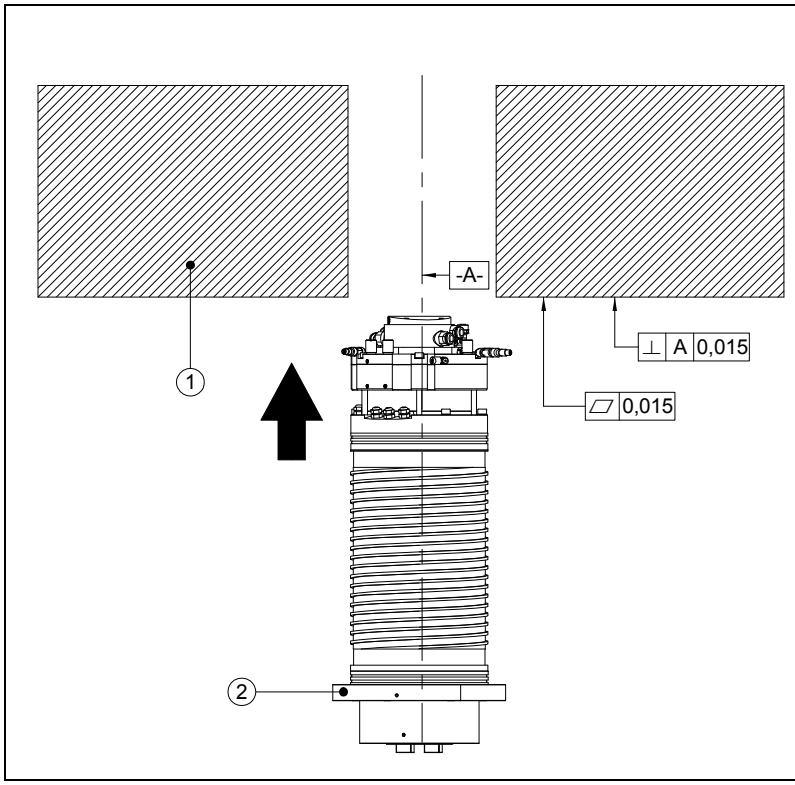
4.3 Mechanical connections

The load-bearing structure on which the product is to be mounted must be sufficiently rigid to support the weight and type of machining to be carried out.

4.3.1 Fixing structure for spindles with round casing

The fixing structure to which the spindle is fixed, must have a flatness of less than 0.015 mm and a perpendicularity to the axis of the spindle of less than 0.015 mm.





1	Fixing structure of the electrospindle
2	Electrospindle

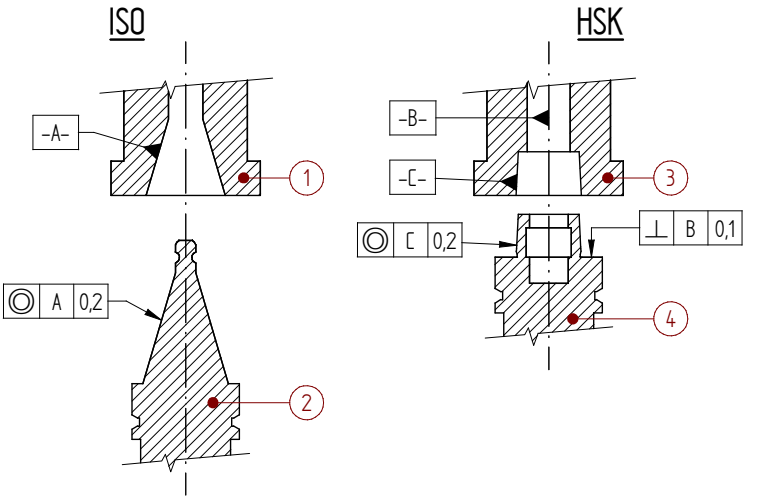
HSD S.p.A. © - 0104h00a.fm051112

4.3.2 Tool change system

The tool holder magazine has to position the cones with the following accuracy:

both ISO and HSK: concentricity between the spindle shaft and tool holder cone 0,2 mm;

HSK only: perpendicolarity between the spindle shaft and the tool holder contact surface 0,1 mm.



1	Spindle shaft ISO
2	Tool holder cone ISO
3	HSK spindle shaft
4	HSK tool holder cone

4.4 Specifications for the compressed air supplied to the manufacturer's products

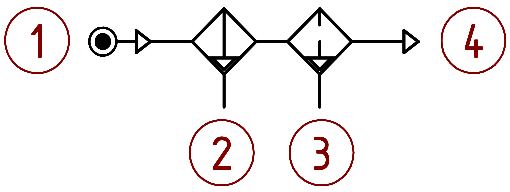
Introduce compressed air with purity according to ISO 8573-1, Class 2 4 3, i.e.:

- **Class 2 for the solid particles: size of the solid particles < 1 μm;**
- **Class 4 for humidity: dew point < 3°C (37.4°F);**
- **Class 3 for total oil: oil concentration < 1 mg / m^3;**

Failure to comply with these specifications may cause the malfunction of the electrospindle.
The guarantee will be deemed as null and void if traces of pollutants are found during repairs.

For example, compliance with the above specifications can be obtained following the instructions written below:

- If the machine has a lubricated air circuit, this must be isolated from the dry air circuit feeding the electrospindle by means of non-return valves.
- The filters shown in diagrams of the following figures must be installed as close as possible to the electrospindle.
- In view of the fact that the efficiency of the filters is <100%, it is important that the machine tool is supplied with suitably treated air.
  As an indication, introduce compressed air with a purity according to ISO 8573-1, classes 7 6 4, into the circuits illustrated below, i.e.:
  - Class 7 for solid particles:
    dimensions of solid particles < 40 µm;
    concentration of solid particles < 10mg/m^3.
  - Class 6 for humidity:
    dew point < 10°C (°F).
  - Class 4 for total oil:
    oil concentration < 5 mg / m^3.
- At the end of the working day, discharge the compressed air system to allow the filters to drain automatically.
- Perform regular maintenance on the filters in line with the manufacturer's instructions and replace them when they become saturated and less efficient (approximately every 6/12 months).

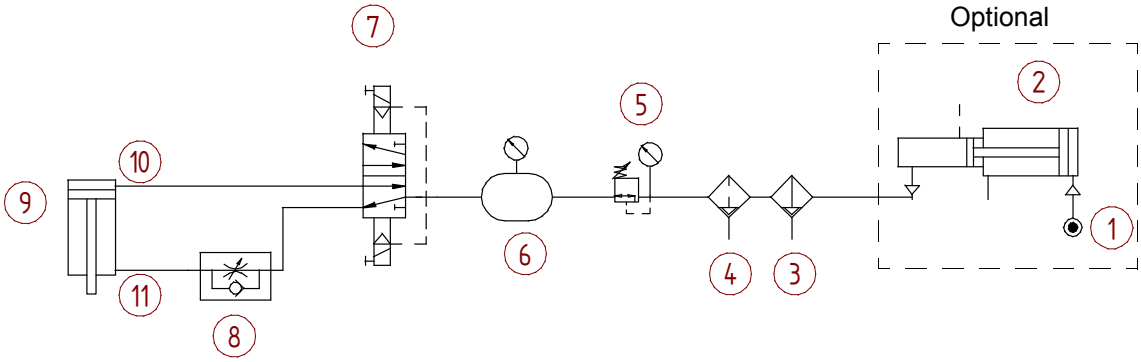


1. Main compressed air supply.
2. Pre-filter 5 µm.
3. Oil separator filter 0.1 µm.
4. To the manufacturer's product.

HSD S.p.A. © - 0104h00a.fm051112

4.5 Example diagrams for pneumatic circuits by the customer

4.5.1 Actuation of the tool change piston (air actuation)



1 6 bar mains supply pressure

2 air multiplier 2:1

3 pre-filter 5 µm

4 oil separator filter 0.1 µm

5 pressure regulator: min 6 bar
max 10 bar

6 pneumatic tank *

7 monostable 5-2 valve with electro-pneumatic control and spring return

8 unidirectional flow regulator (to adjust the locking impulse)

9 cylinder for the tool change

10 Tool release air inlet

11 Piston at the upper end of stroke return air inlet

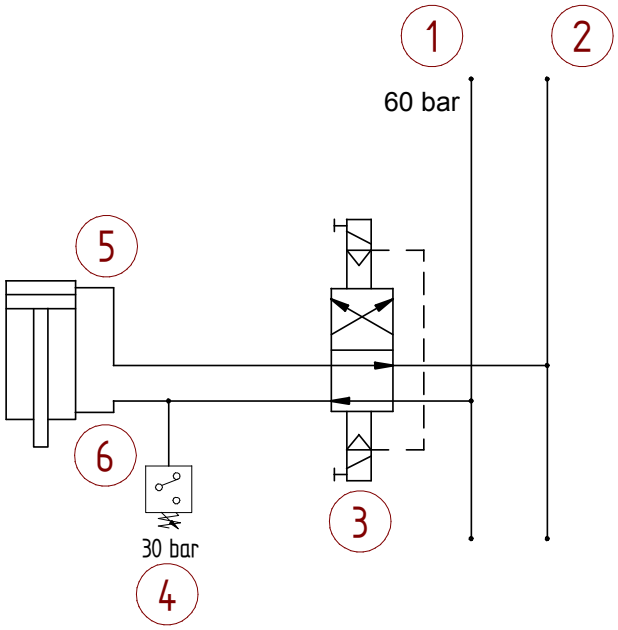
* Tank volume = 0,4 l (useful volume 0,28 l)

The cylinder of this electrospindle is double acting: the cylinder must be kept under pressure when the piston needs to be kept at the upper end of stroke with the tool locked, away from rotating parts.

4.5.2 Actuation of the tool change piston (oil actuation - optional)

i The circuit indicated here is merely an example

The electrospindle ES750 may be optionally fitted with an oil-type cylinder to perform the tool change operations.
An example system layout is shown below.



1 High pressure circuit (60 bar)

2 Low pressure circuit

3 Bistable solenoid valve

4 Safety switch on the piston recovery circuit (calibrated at 30 bar)

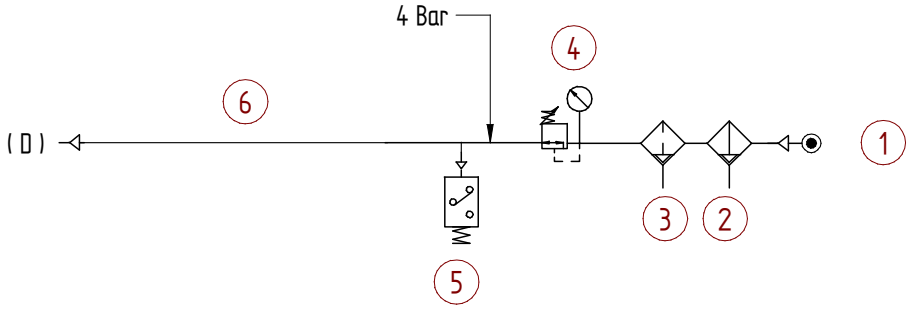
5 Oil inlet for tool release

6 Oil inlet for tool locking

i It is not necessary to supply 60 bar constantly for tool locking.
When the safety switch has confirmed piston recovery at the upper limit switch, you can reduce the pressure to 10 bar.

HSD S.p.A. © - 0104h00a.fm051112

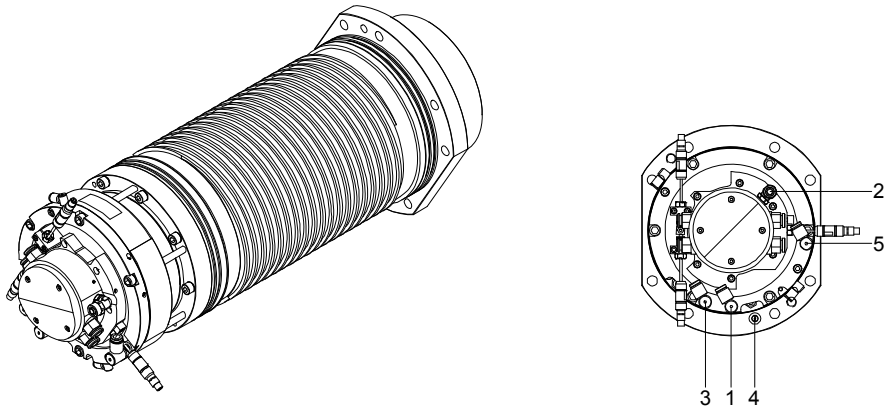
4.5.3 Pressurization supply



1	6 bar mains supply pressure	4	pressure regulator 4 bar
2	pre-filter 5 µm	5	pressure switch calibrated to 4 bar
3	oil separator filter 0.1 µm	6	electrospindle pressurisation

The circuits proposed are indicative only.

4.6 ES748 and ES750 connections for air cylinder

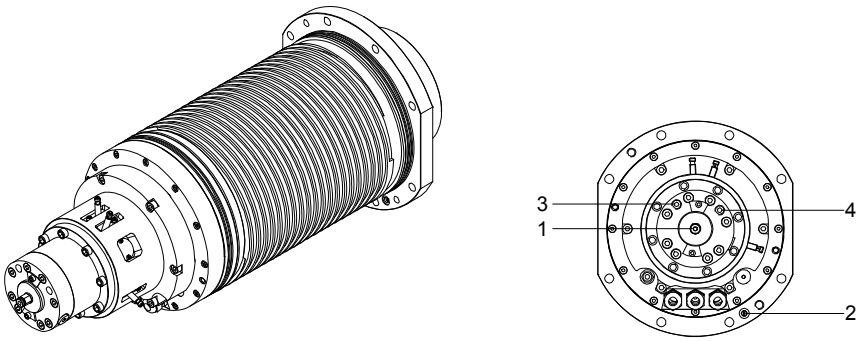


Compressed air connection points

1	Tool locking air inlet (piston return)	5 bar_{min} - Ø8
2	Cleaning of cone 4 bar / tool coolant*	Ø 10
3	Tool change air (expulsion)	6,5 bar_{min} - Ø8
4	Electrospindle pressurisation air inlet	4 bar - Ø8
5	DPC Pressurisation air inlet	4 bar - Ø8

* Max. pressure 4 bar

4.7 ES750 connections for Oil cylinder



Compressed air connection points

1	Cleaning of cone 4 bar / tool coolant*	Ø6
2	Electrospindle pressurisation air inlet	4 bar - Ø8

* Max. pressure 4 bar

Hydraulic connection points

3	Oil inlet for tool release	60 bar_{min} - G1/4
4	Oil inlet for tool locking	10 bar_{min} - G1/4

4.8 Internal pressurisation

The internal pneumatic pressurisation circuit prevents the entry of harmful particles inside the electrospindle. This must be supplied with compressed air at 4 bar (58 PSI), which outlets through the front labyrinth in the spindle nose area, and the drainage holes of the DPC.

The pressurisation air must also be present when the electrospindle is stopped and the machine is on. This will prevent the penetration of dust from other working areas.

With the spindle stopped, check that there is a uniform flow of air from around the spindle shaft (pressurisation) and in the drainage holes of the DPC. If this is not the case, check the efficiency of the pneumatic circuit and check the connections.

i	Pressurisation air consumption	4800 litres/hour(*)
		80 l/min.(*) ± 10%
		2.8 cfm(*)
(*) volume with: P = 4 bar (58 PSI) and T = 20°C (68° F)		

HSD S.p.A. © - 0104h00a.fm051112

4.9 Refrigerator

The manufacturer recommends the use of demineralized water for the cooling system with the addition of 10% ethylene glycol and anti-corrosion additives to ensure the smooth operation of the circuit and the motor.

The gaskets isolating the cooling circuits inside the electrospindle are made of NBR: use additives that do not degrade this material.

On request, the manufacturer supplies ARTIC-FLU-5 (code: H2161H0022) which is a pre-mixed ready-to-use liquid coolant tried and tested by himself.
The product contains monoethylene glycol and eco friendly corrosion inhibitors, without amines, nitrates and phosphates, and can guarantee protection against corrosion for approximately 1 year.
ARTIC-FLU-5 prevents the formation of rust, scale and foam deposits as well as hardening, cracking and swelling of seals and couplings.
The coolant complies with various international standards, including CUNA NC 956-16.

4.9.1 Cooler specifications

Cooling capacity	■ 3400 W (ES748) ■ 5200 W (ES750)
Minimum flow	5 litres/minute
Coolant type	Demineralized water + 10% Ethylene Glycol + corrosion inhibitor
Cooler set temperature	+25+/-3°C (+77+/-5°F)

4.9.2 Cooling characteristics

- Input cooling temperature: t = 20 °C - 30 °C
- Anticorrosive means: V_{max} = 25 Vol%
- Solid materials filter < 100 µm

Type of water additives

BRAND	TIPO (TYPE)
ARAL	SAROL 340 - 2 ÷ 3 %
CINCINNATI	CINCINNATI CIMCOOL MG 602 - 4 %
HENKEL	P3 - PREVOX 6710 - 2 ÷ 3 %
CASTROL	SYNTILO R PLUS - 2 ÷ 3 %

4.10 Tool cooling

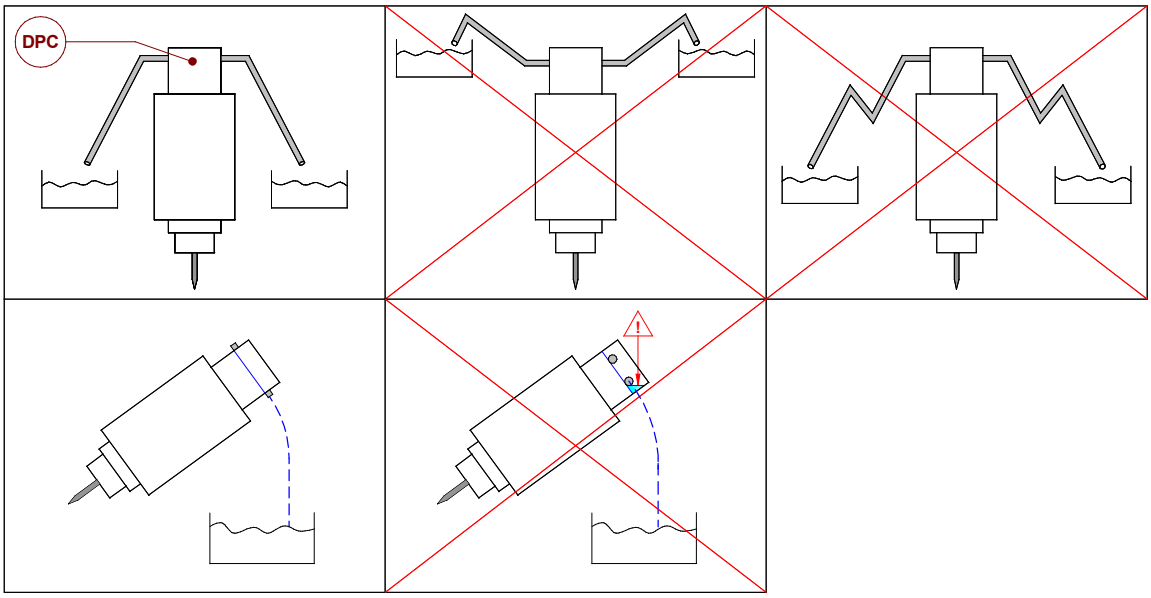
4.10.1 Tool internal cooling and drainage of the rotating distributor

The cooling water runs through the rotating distributor to the tool (DPC, patented). The excess water runs through the DPC drainage holes. The more the tool obstructs the flow the more the drained water.

The excess water gets eliminated. To allow a complete drainage, refer to the following instructions:

To make the distributor (DPC) correctly works and to avoid ruining the electrospindle, follow the instructions below:

- **The water to be used to internally cool the tool must comply with the below characteristics;**
- **Filter the cooling water by means of a 25 µm filter. Perform regular maintenance on the filter in line with the manufacturer's instructions and replace it when it becomes saturated and less efficient;**
- **Supply the DPC with a < 10 l/min delivery (0,35 CFM);**
- **The distributor drainage holes must always be clear;**
- **The DPC drainage pipes must be orientated downwards. The pipes must remain downwards orientated even when the machine moves the electrospindle (figures below);**
- **Tilt the electrospindle towards the drainage holes side (figure below).**



HSD S.p.A. © - 0104h00a.fm051112

4.10.2 Tool external cooling

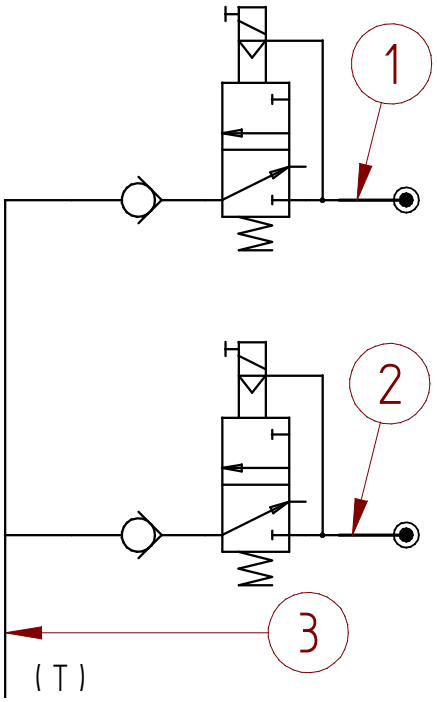
The water to be used to externally cool the tool must comply with the below characteristics:

- aggressive index (A.I.) = 11-12
- Electric conductibility no greater than 600 microS/cm
- Turbidity not higher than 20 mg/l
- Chlorides no greater than 300mg/l

Only with an accurate analysis is it possible to establish whether the water used for the machining operation falls within the required parameters.

Do not use additives with sodium chloride (NaCl) as they provoke corrosion (rust).

4.11 Example diagram of the cone's cleaning circuit



1 Air inlet 4 bar

2 Water inlet for the tool

3 To be connected to the tool coolant/cone cleaning inlet

The diagram in the figure represents a possible example of the pneumatic circuit for the automatic cleaning of the cone. During the tool change the water supply is interrupted and replaced by pressurised air, which removes any particles. The jet of compressed air must be on until the collet remains open.
The control and regular cleaning of the cone is imperative, as described in chapter 7.

4.12 Electrical connections

The electricity supply to the electrospindle MUST be through an inverter.

The position of the electrical connectors or the outlet of the free cables is shown in paragraph 2.1.
In addition to the supplied electrical plug connector, pre-wired plug connectors of various lengths are also available on request.

4.12.1 Power cables

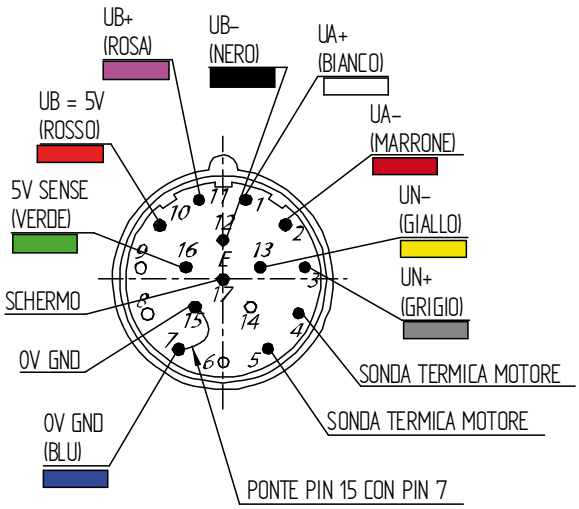
WHITE	U Phase
RED	V Phase
BLACK	W Phase
YELLOW/GREEN	Earth

HSD S.p.A. © - 0104h00a.fm051112

4.12.2 Encoder wiring + motor thermal probe

ES748

Encoder L+B 1Vpp and TTL with connector



TTL manufacturer encoder without connector

Yellow	A+
GREEN	A-
BROWN	B+
BLUE	B-
GREY	N+
WHITE	N-
RED	24V
BLACK	0V
BROWN	THERMAL
BROWN	THERMAL

ES750

Encoder L+B 1Vpp and TTL without connector

WHITE	UA+
BROWN	UA-
PINK	UB+
BLACK	UB-
GREY	UN+
Yellow	UN-
RED	UB = 5V
BLUE	0V GND
GREEN	5V Sense

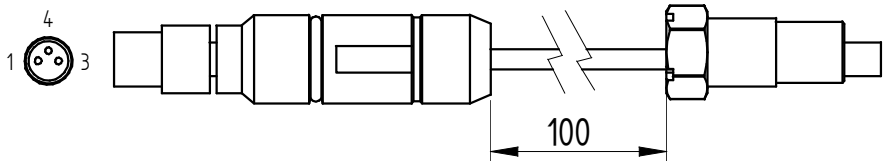
TTL manufacturer encoder without connector

Yellow	A+
GREEN	A-
BROWN	B+
BLUE	B-
GREY	N+
WHITE	N-
RED	24V
BLACK	0V
BROWN	THERMAL
BROWN	THERMAL

4.12.3 Sensor connections

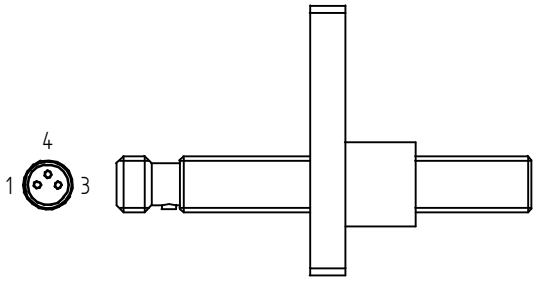
Sensor unit ES748 and ES750 with air cylinder

1	+Vcc
3	0 V
4	Output



Sensor unit ES750 with oil cylinder

1	+Vcc
3	0 V
4	Output



4.12.4 Analogue sensor

Available as an option only with electrospindles ES750 with oil cylinder.

COLOUR	Signal
BROWN	24V
BLUE	0V
BLACK	Output

HSD S.p.A. © - 0104h00a.fm051112

5 General post-installation checks

5.1 Electrospindle pre-startup checks

5.1.1 Pneumatic circuit

- The tubes of the pneumatic circuit must be of the diameter specified in section 4.6 “ES748 and ES750 connections for air cylinder”. Introduce dried and filtered compressed air according to the specifications in the said section;
- for the connections, see possible labels on the product, and section 4.6 “ES748 and ES750 connections for air cylinder”;
- the pressurising air must always be present, even when the electrospindle is stationary: check (with the electrospindle stationary and the tool holder inserted) that a uniform and continuous flow of air exits from the labyrinth on the spindle nose;
- the cone cleaning air must be present during the tool change;
- The progress of the tool holder cone ejection must be that specified in section 6.4.1 “Tool holder locking and ejection device”.

5.1.2 Hydraulic circuit

- The liquids used must meet the specifications and instructions in section 4.9 “Refrigerator”.

5.1.3 Electrical circuit

- **The earth of the product (indicated in the section from 4.12) must be connected to the earth of the machine;**

- **The thermal cut-out must activate a safety procedure to protect the electrospindle windings against overheating (see section 6.9.5 “Use and technical characteristics of the thermal alarm”).**

5.1.4 Inverter programming

- The maximum voltage set on the inverter must correspond to the rated value indicated on the motor rating plate.
- The set frequency value at which the voltage becomes maximum (rated frequency) must correspond to the rated value indicated on the motor rating plate.
- The maximum speed set on the inverter must correspond to the value indicated on the motor rating plate.
- The maximum continuous current set on the inverter must correspond to the rated current value indicated on the motor rating plate.
- Contact the manufacturer if it is considered necessary to check the other parameters of the inverter.

HSD S.p.A. © - 0105h00a.fm051112

5.2 First start-up checks

Start the electrospindle only if the sensors (where present) verify the following conditions simultaneously:

Sensor 1	**ON**	**Tool holder cone present**
Sensor 2	**OFF**	**Collet closed**
Sensor S1+S4 (HSK versions only)	**ON**	**Tool holder cone inserted and in contact with the HSK surface**
Sensor 5	**ON**	**Piston in safety**

The sensor “ON” condition corresponds to an output of +24 V.
The sensor “OFF” condition corresponds to an output of 0 V.

With ES750 fitted with oil cylinder, only start up the electrospindle if the sensors indicate that the tool is connected - see the table in paragraph 6.9 “Sensors”.

The electrospindle must not be started without the tool holder inserted.

The cylinder of the spindle is double acting: the cylinder must be kept under pressure to hold the piston on the upper limit switch, away from fast-rotating parts.
The safety condition is indicated by the output “ON” of sensor S5.

- The control sensors must intervene according to the logic described in paragraph 6.9 “Sensors”.
- The tool change cycle must only take place with the shaft stopped.
- with the tool holder inserted and without performing machining operations, perform the preheating cycle described in paragraph 6.3.

HSD S.p.A. © - 0105h00a.fm051112

6 Use and adjustment

6.1 Environmental conditions

The manufacturer has tested and verified its electrospindles according to environmental conditions standard (IEC 60034-1:2006-05).
Contact the manufacturer for information regarding applications in special environments.

6.2 Running-in

Prior to being packed, the electrospindle is subjected to an automatic running-in cycle to ensure the correct distribution of lubricant (long-life grease) along the ball races of the bearings and to run-in the balls and races of the bearings themselves. The running-in cycle also includes a detailed check of all the control and signalling devices through the simulation of various machining cycles on the test-bench.

6.3 Warm-up

The manufacturer uses high-precision angular contact bearing pairs, pre-loaded and lubricated for life with special high-speed grease.
When starting-up the electrospindle for the first time each day, allow it to run a short warm-up cycle to allow the bearings to gradually reach a uniform operating temperature and obtain uniform expansion of the races and correct pre-loading and rigidity.

The following cycle, with a tool holder inserted and without performing machining operations, is recommend:

- **50% maximum rated speed for 2 minutes;**
- **75% maximum rated speed for 2 minutes;**
- **100% maximum rated speed for 1 minute.**

Pre-heating cycle must also be performed each time the machine is not working for a period of time sufficient to cool the electrospindle to room temperature.

During machining, the spindle can reach high temperatures and, as such, must not be touched without taking the due precautions.

To perform the preheat it is necessary to insert a tool-holder WITHOUT a tool.

6.4 Collet

6.4.1 Tool holder locking and ejection device

The tool holder is locked mechanically by means of elastic springs that develop an axial force equal to:

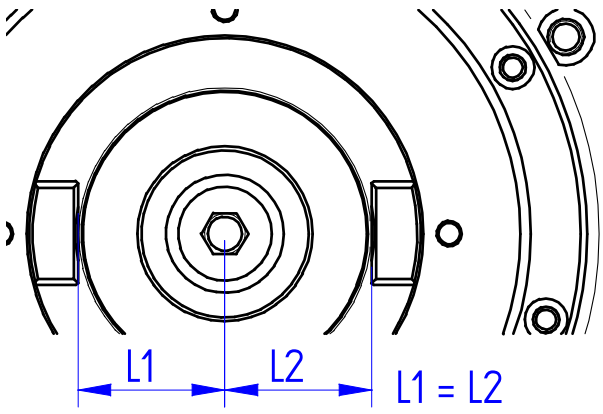
ELECTROSPINDLE MODEL	AXIAL FORCE OF THE SPRING	AXIAL FORCE ON THE TOOL HOLDER
ISO 50	9900 N +/- 10%	9900 N +/- 10%
HSK B100	9800 N +/- 10%	28000 N +/- 10%

The tool holder locking and ejection are activated by the movement of a double-acting compressed air piston with a pressure of 10.

6.5 Tool holder cone

- The geometry of the taper of the cones must comply with norm DIN69893;
- The geometry of the taper of the cones has to reflect the standard DIN69871;
- Avoid the presence of inserts, slots or other forms that could disturb the dynamic balance of the tool holder;
- The dynamic balance quality grade must be G = 2.5 or better (standard ISO1940);
- The balancing is carried out with the tool holder assembled (cone, spring collet, ring nut, tool).

It is forbidden to use tool holders that do not comply with the above conditions. Non compliance with these instructions can lead to a risk of breakage or an imperfect coupling of the tool holder cone, with the resulting risks for the user.



NOTE:
In the ISO tool-holders, the tenons positions does not comply with norm DIN69871. For further information refer to the spindle drawing.

HSD S.p.A. © - 0106h00a.fm051112

6.5.1 General recommendations regarding tool holder cones

IMPORTANT:

- **The choice of tool holder is a determining factor as regards safety.**
- **The tapered surfaces of the tool holder and its housing on the spindle-shaft must be kept extremely clean to allow safe coupling (see section 7 "Programmed maintenance").**
- **During machining operations, avoid all contact whatsoever between the non-cutting rotating parts and the piece being machined.**
- **The tool holder cone seating must always be protected against the entry of impurities: use a suitable plug or a tool holder cone.**
- **At the end of the working day, always remove the tool holder cone from the electrospindle to avoid sticking. Close the tool holder housing using a clean tool holder cone at ambient temperature.**
- **Do not rotate the electrospindle without a tool holder inserted. Rotating the electrospindle without a tool holder will upset the balance and operation of the HSK collet. The tool holder must be introduced until in contact with the nucleus of the collet.**

6.6 Tool

The tools must have a dynamic balance grade of G=2.5 or greater (standard ISO1940).

RESPECT THE MAXIMUM REVOLUTIONS PER MINUTE (rpm) INDICATED BY THE TOOL MANUFACTURER.

Depending on the type and quality of the machining operation to be performed, and the material used, it is the users responsibility to operate at lower speeds (NEVER HIGHER) than those specified by the tool manufacturer.

When selecting the tool to use, the following recommendations must be taken into consideration:

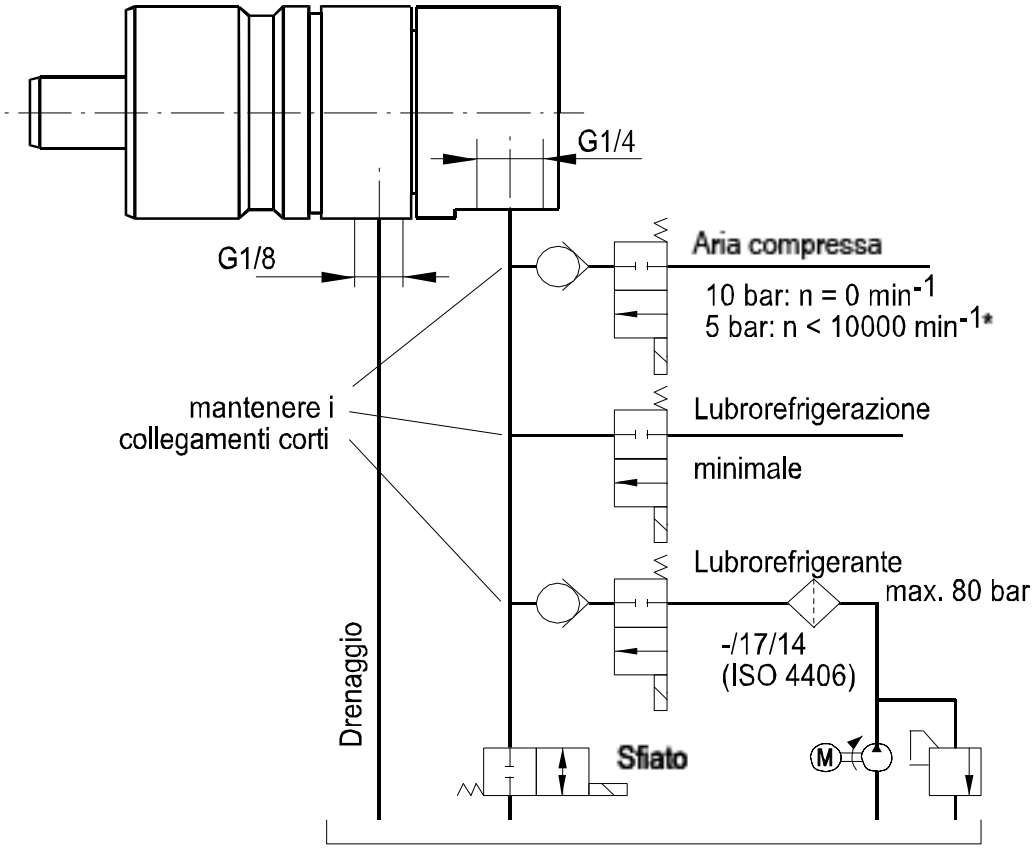
- Always use tools with optimum sharpness qualities and correctly tightened in the relative tool holder.
- Never use deformed or damaged tools or those with missing parts or not perfectly balanced.
- Always make sure that all the surfaces are unmarked and perfectly clean before inserting the tool in the relative collet.
- The essential requisites for using high-speed tools are:
  - compact, short and light tools
  - precise, with any inserts correctly fitted with a high degree of safety
  - balanced and symmetrically coupled with the tool holder
  - with cutting edges near to the rotation axis.

6.7 Fluids distributor

As an option, the electrospindle can be fitted with a rotating distributor for internal tool cooling purposes. The cooling is performed with the aid of cooling liquids.
This option is only available for the ES750 electrospindle, fitted with oil cylinder.The hydraulic connection points are illustrated in section 4.9.
The standard distributor must have the following characteristics:

Characteristics	
Minimum pressure	5 bar
Maximum pressure	80 bar
Cooling liquid filtering degree	50 µm
Dry rotation*	possible
Maximum capacity	60l/min

* not allowed with pressurised air

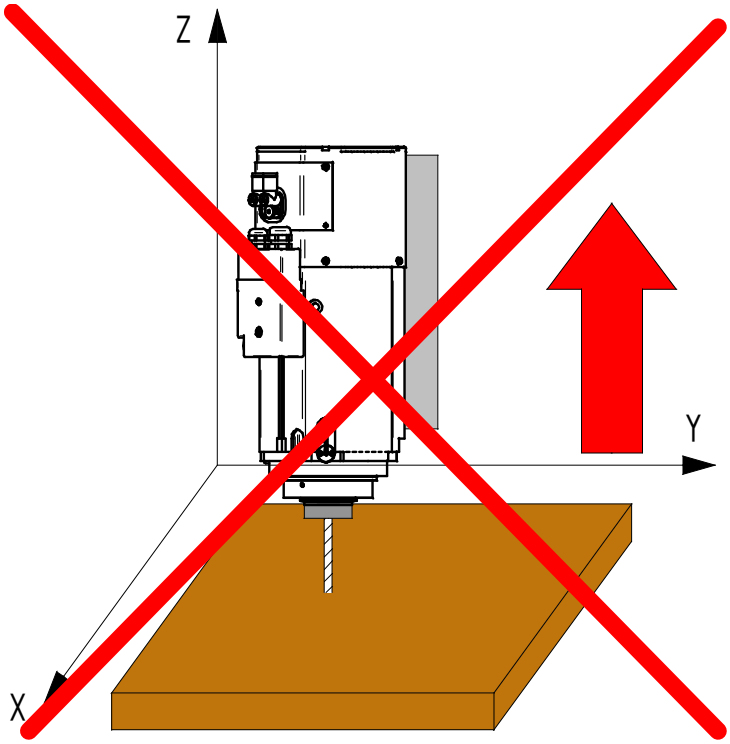


i If you want to use a rotating distributor other than the standard one offered by the manufacturer, contact the manufacturer's technical service office.

HSD S.p.A. © - 0106h00a.fm051112

6.8 Procedure to follow if the tool becomes jammed in the piece being machined

For models with ISOP type tool coupling, in the case where the machine goes into alarm status or stops with the tool locked onto the piece being machined, do not move the spindle along the Z-axis!

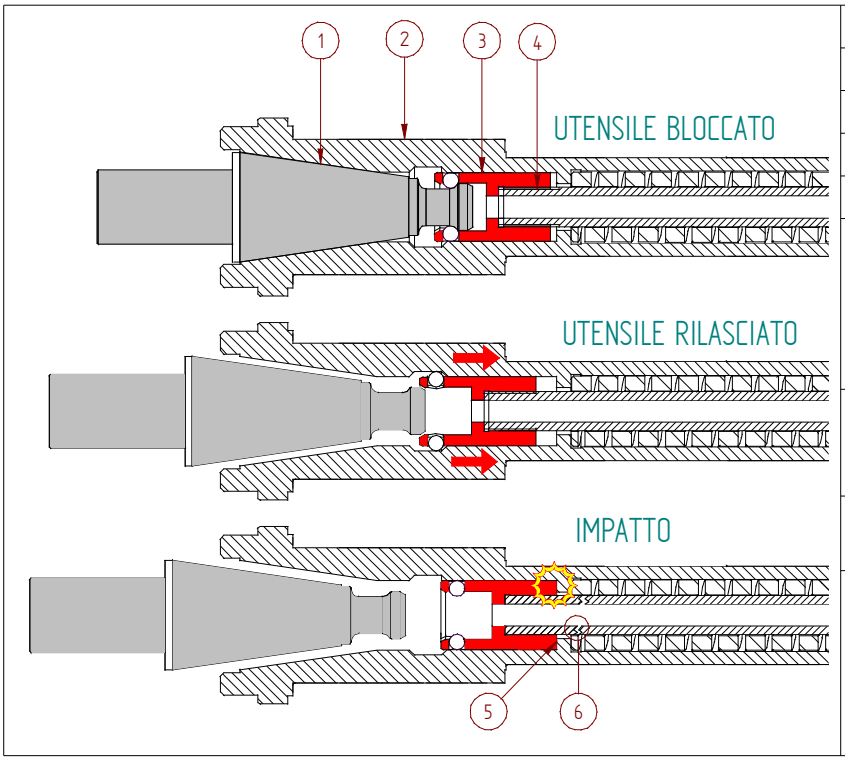


If possible, free the piece by hand and then perform a tool change.

If this is not possible, proceed as follows:

- Supply air to the tool change circuit;
- Slowly move the spindle away from the work piece by moving it along the Z-axis until the collet opens (sensor S2 output “ON”);
- Make sure that the cone has been freed from the collet;
- Move the spindle away from the work piece;
- Then manually remove the jammed tool.

If this procedure is not followed, the tool holder will drag the locking system (collet/screw dowel) with it until the cone is released. After which, the collet will move back violently due to the force exerted by the spring and could cause damage to the screw dowel.



N.	Description
1	ISO cone
2	Spindle shaft
3	ISO collet (or nut)
4	Screw dowel
The arrows indicate the direction in which the locking system returns after having freed the cone	
5	Point at which the collet will hit the shaft
6	Screw dowel breakage

6.9 Sensors

The electrospindles are fitted with inductive sensors[1] for monitoring, S1, S2, S3 (version ES750 with oil cylinder only), S4 (for HSK version only), S5 (if the cylinder unit is present), and with a "thermal alarm".

NAME	SIGNAL INFORMATION
S1	Tool holder present
S2	Collet open - Tool uncoupled
S3*	Tool is lacking or is too long
S1+S4**	Correct tool holder coupling
S5***	Piston at the upper end of stroke

* Only for ES750 version with oil cylinder

** For HSK version only

*** If the cylinder unit is present

[1] Electrospindle version ES750 fitted with oil cylinder may also be fitted with an analogic sensor.

HSD S.p.A. © - 0106h00a.fm051112

6.9.1 Electrospindle statuses and corresponding analogue sensor outputs

Reading range		2 ÷ 5	mm
Power supply		14 ÷ 30	V DC
Output voltage		0 ÷ 10	V
Output voltage	Collet closed without tool	3,5 ÷ 5	V (23°)
	Collet closed, tool coupled	2 ÷ 3,5	V (23°)
	Tool badly coupled	1,2 ÷ 2	V (23°)
	Tool ejected	0,8 ÷ 1,2	V (23°)

6.9.2 Technical characteristics of inductive sensors

Proximity PNP type Normally Open (N.O.)	
Power supply voltage	10 - 30V (DC)
Maximum load	100 mA
No-load absorption	<17 mA
Nominal reading distance	1 mm

S4 (HSK version)

Proximity PNP type Normally Closed (N.C.)	
Power supply voltage	10 - 30V (DC)
Maximum load	100 mA
No-load absorption	<17 mA
Nominal reading distance	1 mm

6.9.3 Status of the electrospindle and output of the inductive sensors

	S1	S2	S5
Collet open (tool holder cone ejected)	**OFF**	**ON**	**OFF**
Tool holder cone locked correctly	**ON**	**OFF**	**ON**
Collet closed but with no tool holder cone	**OFF**	**OFF**	**ON**

* according to the operational status of the machine

HSK B100

	S1	S2	S1+S4	S5
Collet open (tool holder cone ejected)	**OFF**	**ON**	**OFF**	**OFF**
Tool holder cone locked correctly	**ON**	**OFF**	**ON**	**ON**
Collet closed but with no tool holder cone	**OFF**	**OFF**	**OFF**	**ON**

* according to the operational status of the machine

ES750 with oil cylinder

Status	S1	S2	S3
Tool released	OFF	ON	OFF
No tool holder	ON	OFF	ON
Tool holder connected	**ON**	**OFF**	**OFF**
Tool holder badly connected (case 1: tool too long)	ON	OFF	ON
Tool holder badly connected (case 2: tool too short)	OFF	OFF	OFF

Tool holder present but not correctly locked. This situation is indicated by the output:

	S1	S1+S4
	ON	**OFF**

This condition is dangerous: if it is detected, stop the rotation or the tool change procedure, inspect the machine and remove the cause preventing the tool holder from coupling correctly.

The electrospindle shaft can only rotate in the "*tool holder cone correctly locked*" state. If outputs S1+S4 and S5 change to “OFF”, stop the rotation of the electrospindle shaft.

HSD S.p.A. © - 0106h00a.fm051112

6.9.4 Description of the sensors

- **Sensor S1: “Tool holder present” signal**

The signal from sensor S1 indicates the presence of the tool holder cone.

Ignore output S1 during the period from the release command to the couple tool command.

- **Sensors S1+S4: Tool holder locked signal**

Both sensors S1 and S4 are connected in series:sensor S1 checks the presence of the tool holder cone, and in case it is present it enables the reading of sensor S4 which will check its position. The output only changes to “ON” if both conditions are verified as positive.

Ignore the S1+S4 output during the period from the release command to the couple tool command.

- **Sensor S2: “collet open” signal**

Signal S2 is used during the tool change cycle: it detects the opening of the collet and whether it is possible to continue with the next phases of the tool-change cycle.

- **Sensor S5: Piston “upper end of stroke” signal**

Sensor S5 is “ON” when the piston is at the upper end of stroke position.
The piston is double acting and should therefore be fed to be moved and maintained in this position. The electrospindle can be seriously damaged if the rotation occurs when the piston is not at the upper end of stroke position.

The electrospindle shaft can only rotate in the *"tool holder cone correctly locked"* state. If outputs S1 or S5 change to “OFF”, stop the rotation of the electrospindle shaft.

The ES750 electrospindle with oil cylinder is fitted with sensor S3 instead of sensor S5.If sensor S3 is ON then the tool is lacking or is too long.

- **Sensor S3: Lacking tool or too long tool signal**

The signal from sensor S3 indicates the lacking of the tool in the closed collet or indicates a too long tool in the cone (out of tolerance).If the shaft starts running this will ruin the collet and could break and release some parts of the electrospindle.

6.9.5 Use and technical characteristics of the thermal alarm

The electrospindle is fitted with a normally-closed bimetallic strip switch inserted in the electric windings of the stator which opens when a temperature that may damage the windings is reached. The contacts re-close when the temperature reduces and returns to the safe values.
The thermal alarm must be connected to the Numerical Control, which should interrupt the machining operation and stop the rotation of the spindle shaft if the switch opens.

If the shaft stops while the tool is still being pushed against the piece being machined, the spindle bearings may break. If the tool is not immediately moved away from the piece and the rotation stopped, there is a risk of burning out the stator.

For the bimetallic strip switch connection, see section 4.12 “Electrical connections”.

Technical characteristics of the bimetallic strip:

Power supply	48 V DC MAX
Current	1.6 A MAX
Switching cycles	10000 Cycles
Contact interruption time	< 1 ms
Contact resistance (according to MIL R 5757)	< 50 mΩ
Isolation voltage	2 kV

6.10 Encoder

6.10.1 General description

The encoder incrementally encodes the position data detected by signals A and B, A negated and B negated.
The signals are in phase quadrature, i.e. the signals A, B, A- ??and B- are offset from each other by 90 degrees.

The encoder also provides Zero and Zero denied signals.

There are two encoder models available with a different number of rotation pulses depending on the electrospindle:

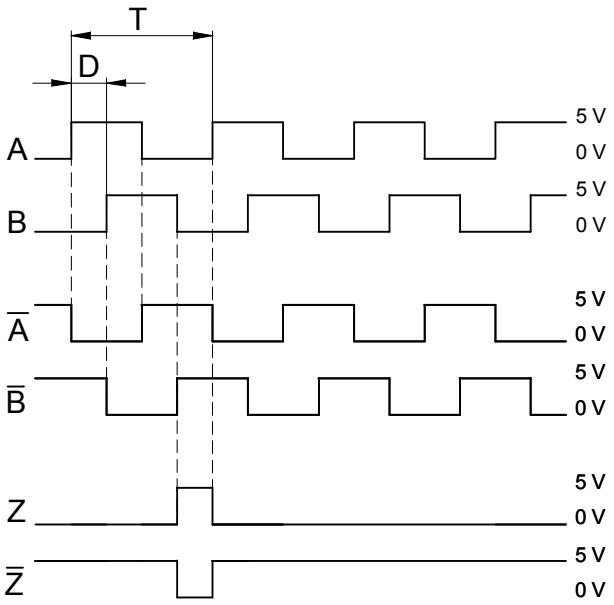
- "Square Wave" from the manufacturer;
- Lenord+Bauer "Square Wave";
- "Sine" (Lenord+Bauer);

HSD S.p.A. © - 0106h00a.fm051112

6.10.2 Technical characteristics of the manufacturer's rectangular encoder

CHARACTERISTICS	VALUE
Rated power supply	12 V DC ÷ 24 V DC +/- 10%
Absorption	99 mA to 12 V DC 51 mA to 24 V DC
Operating temperature	0°C ÷ 70°C (+32°F ÷ 158°F)
Max. operating altitude	2000m (6500ft)
Signal input	750 pulses per rotation + zero notch
Signal output	TTL electrical levels compatible (0V, +5V line driver)

Manufacturer's Square Wave encoder signal

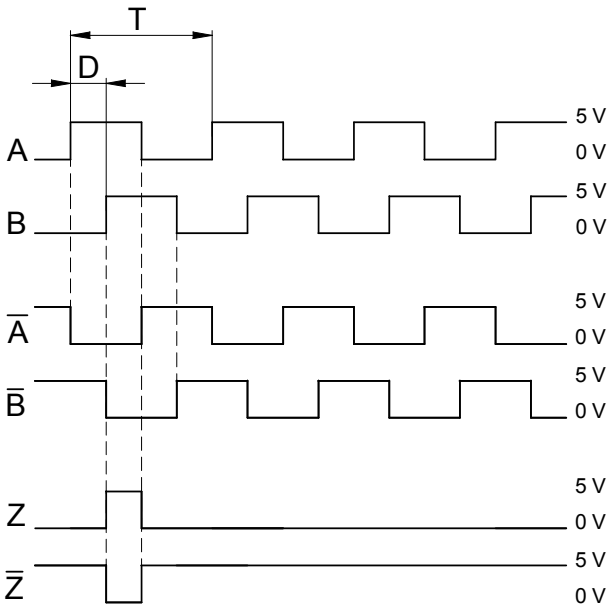


T	Period
D	Phase displacement (D=T/4)

6.10.3 Lenord+Bauer Square Wave Encoder technical specifications

CHARACTERISTICS	VALUE
Rated power supply	5V DC +/- 5%
Operating temperature	-30°C ÷ +85°C (-22°F ÷ +185°F)
Max. operating altitude	2000m (6500ft)
Signal input	1024 pulses per rotation + zero notch
Signal output	TTL electrical levels compatible (0V, +5V line driver)

Lenord+Bauer Square Wave Encoder Signals



T	Period
D	Phase displacement (D=T/4)

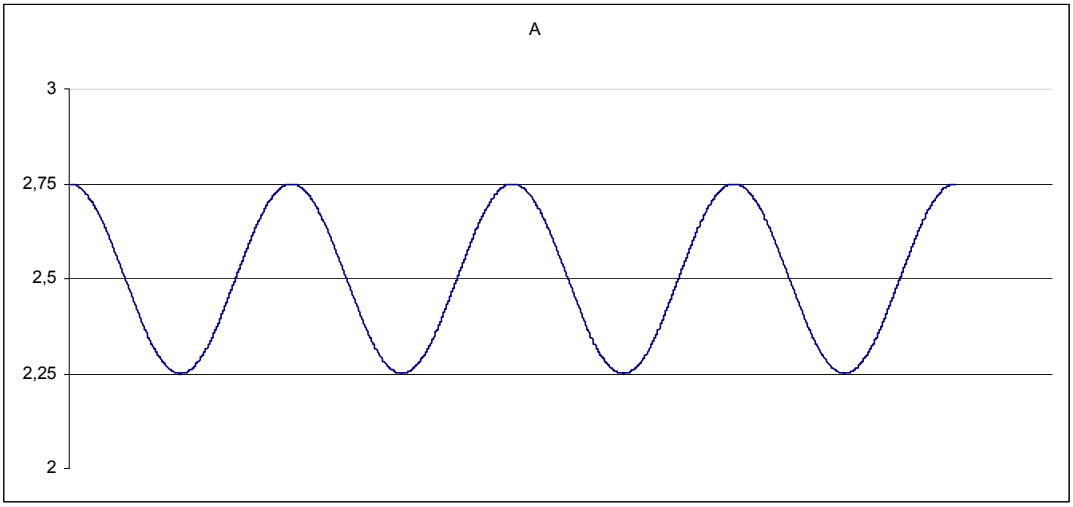
A voltage level higher than the one specified (5V ±5%) may damage the encoder reader.

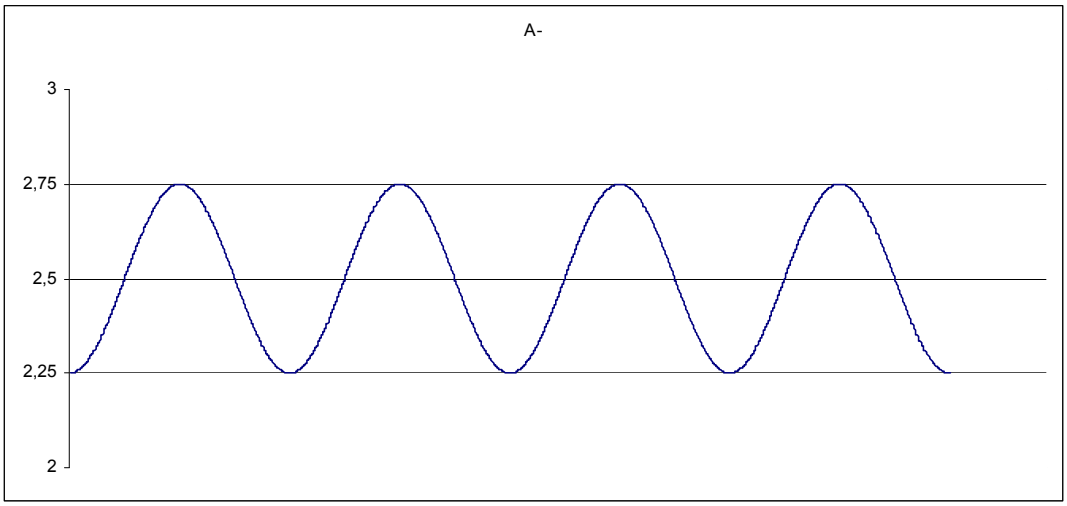
HSD S.p.A. © - 0106h00a.fm051112

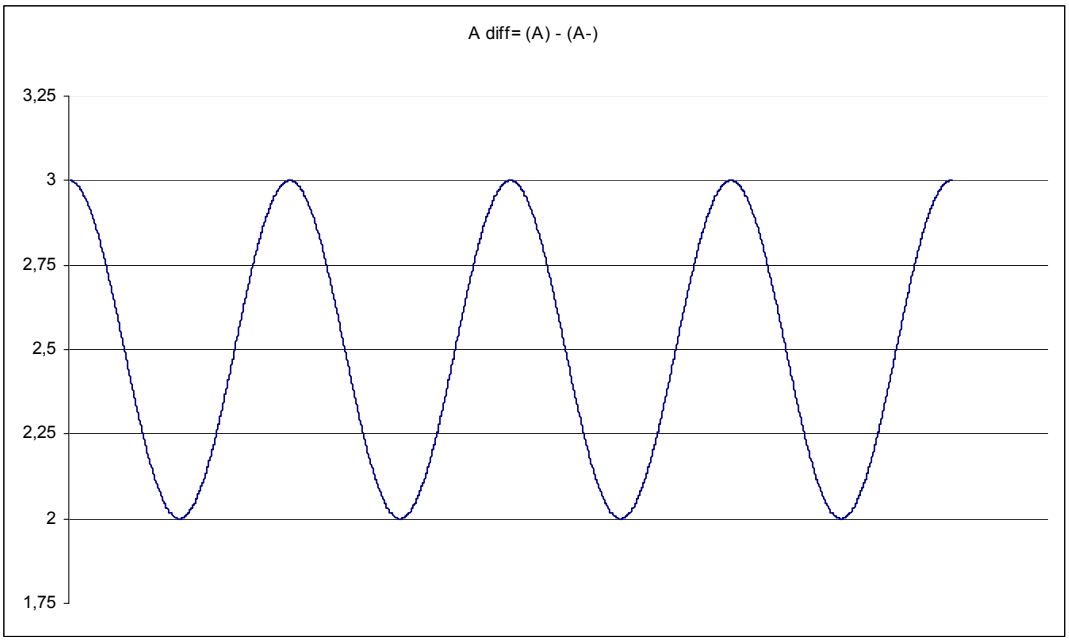
6.10.4 Technical characteristics of the Lenord+Bauer sine encoder

CHARACTERISTICS	VALUE
Rated power supply "U"	5V DC +/- 5%
Operating temperature	-30° C ÷ 85° C (-22° F ÷ 185° F)
Max. operating altitude	2000m (6500ft)
Signal input	256 pulses per rotation + zero notch
A/B signal output	500 mV peak-to-peak with average value “U ref.”=U/2
	1V peak-to-peak as difference of signals with average value “U ref.” (see figures below)
A/B signal phase displacement	90° (a quarter period)
Z signal output	500 mV peak compared with idle value U ref. ±80mV
	1V peak as difference of signals with idle value U ref.-160mV= 2.34V (see figures below)

Temporal flow of signal A:

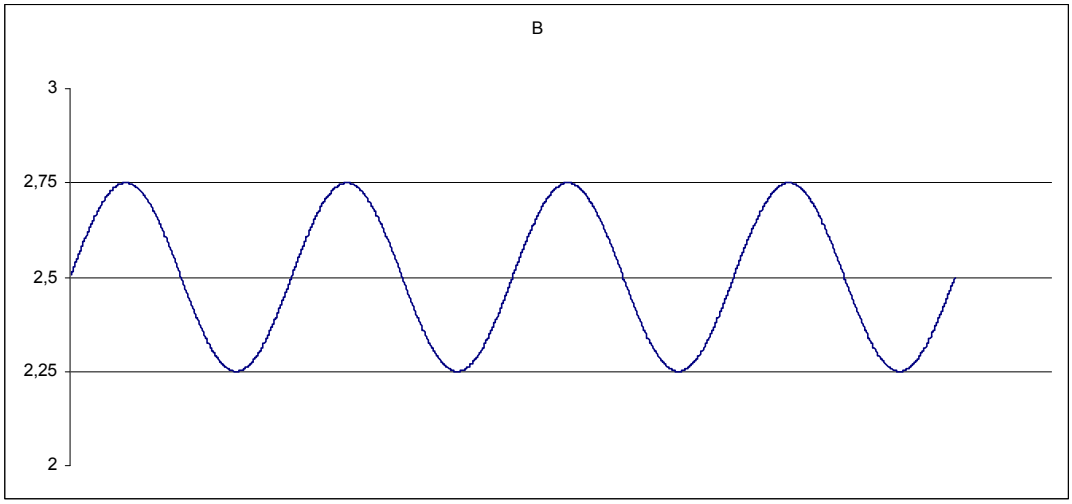


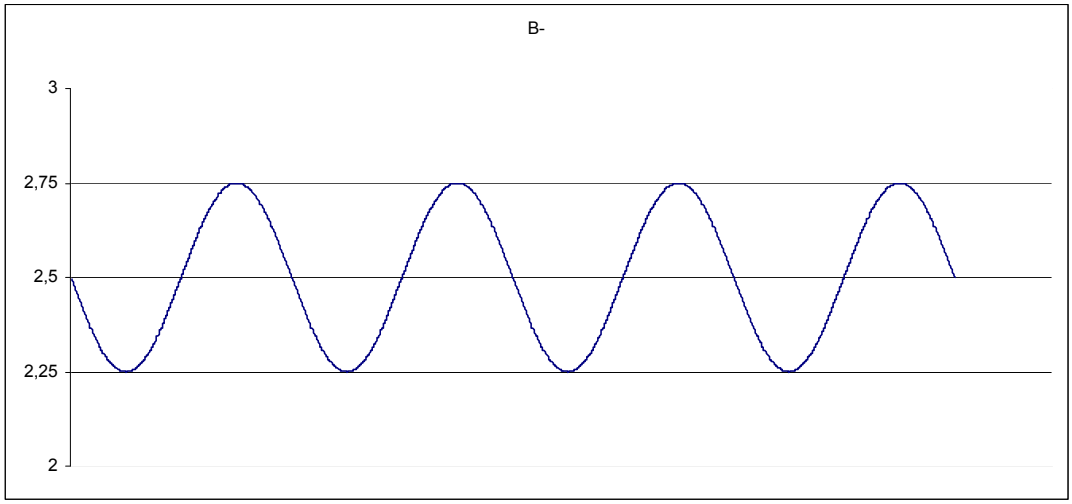


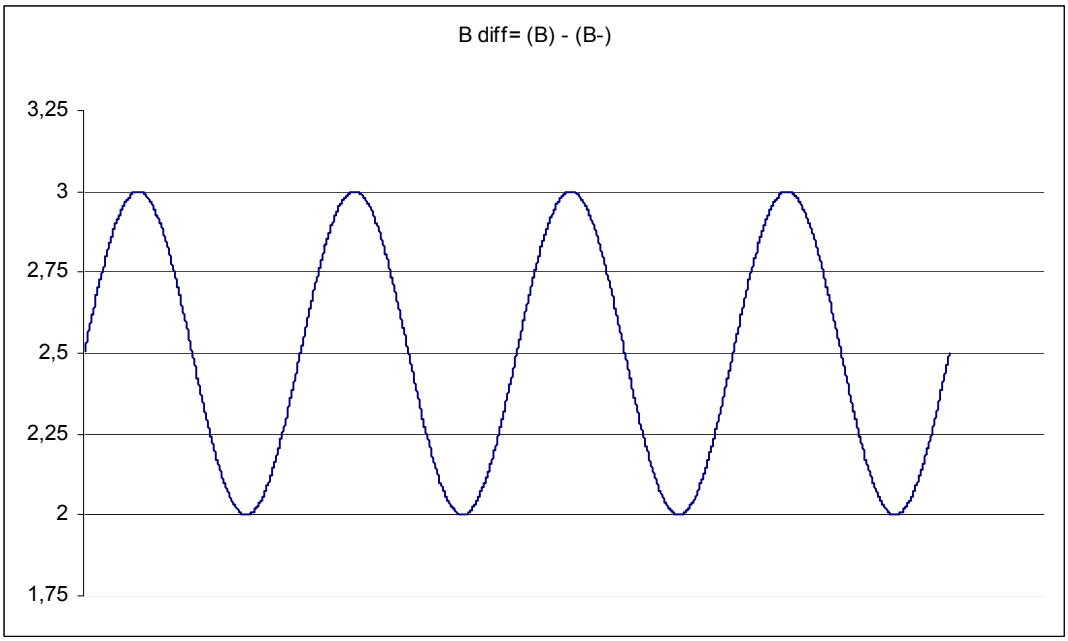


HSD S.p.A. © - 0106h00a.fm051112

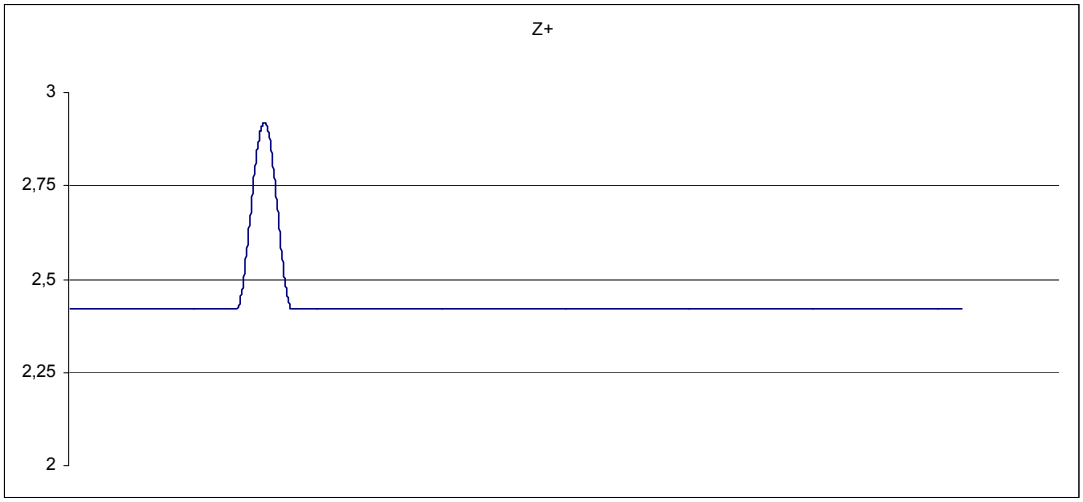
Temporal flow of signal B:

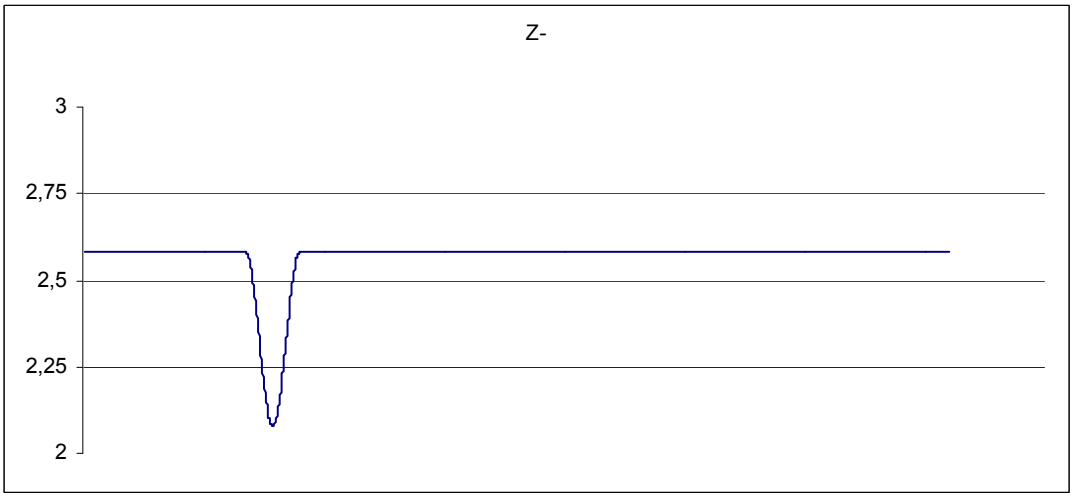


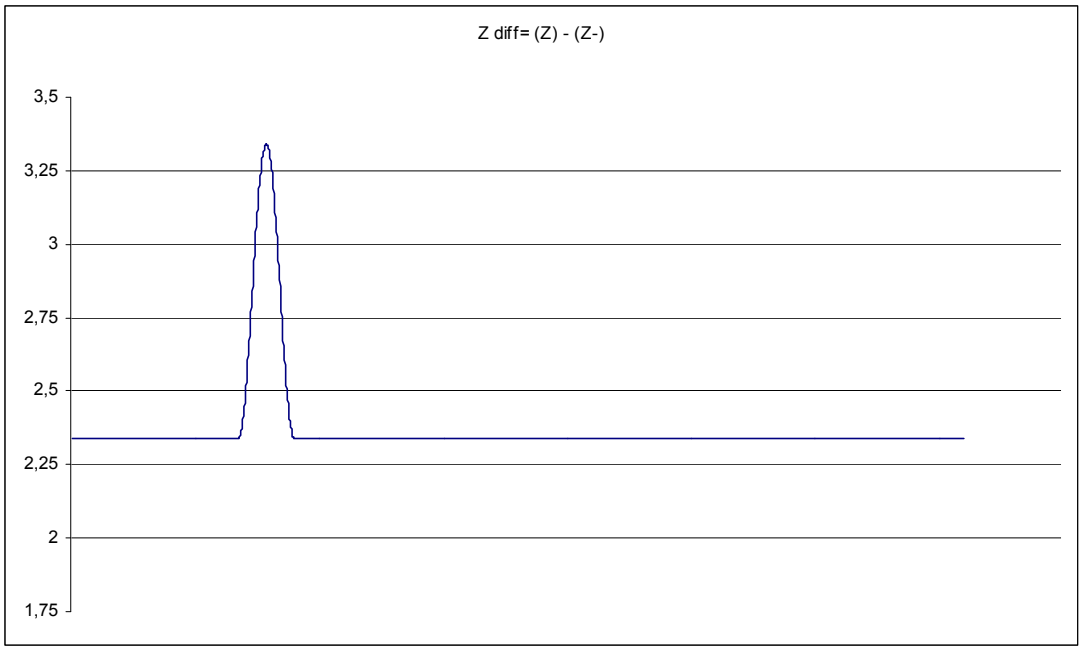




Temporal flow of signal Z:

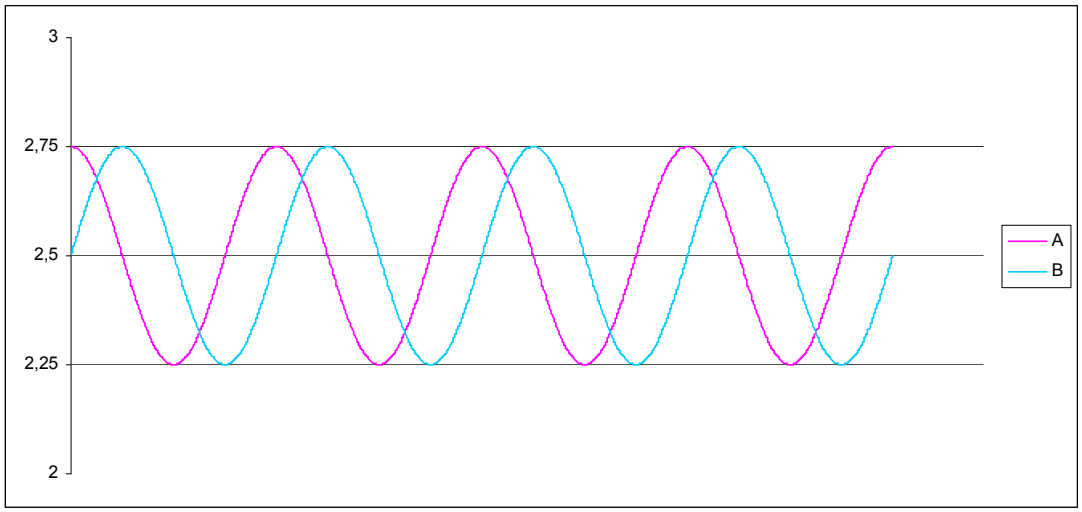




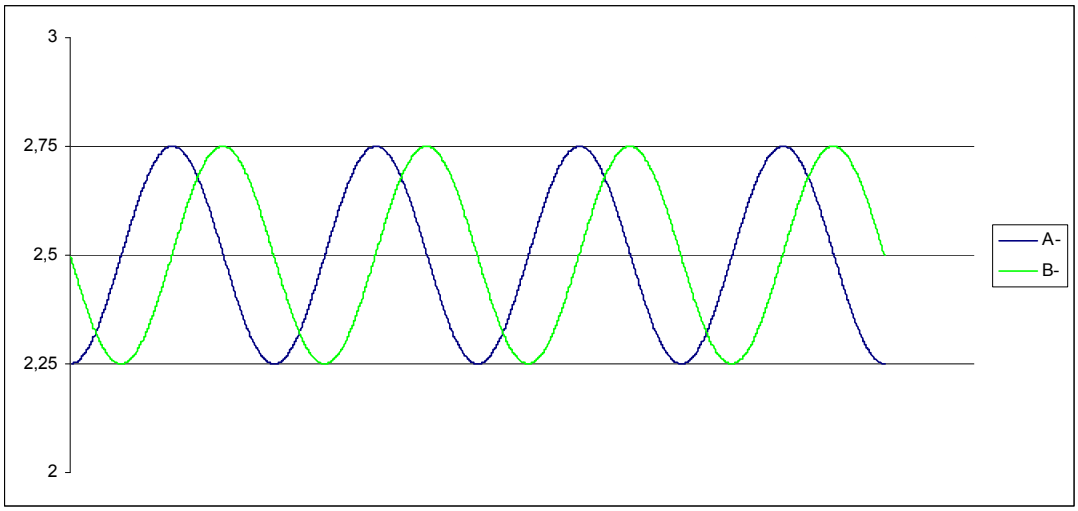


HSD S.p.A. © - 0106h00a.fm051112

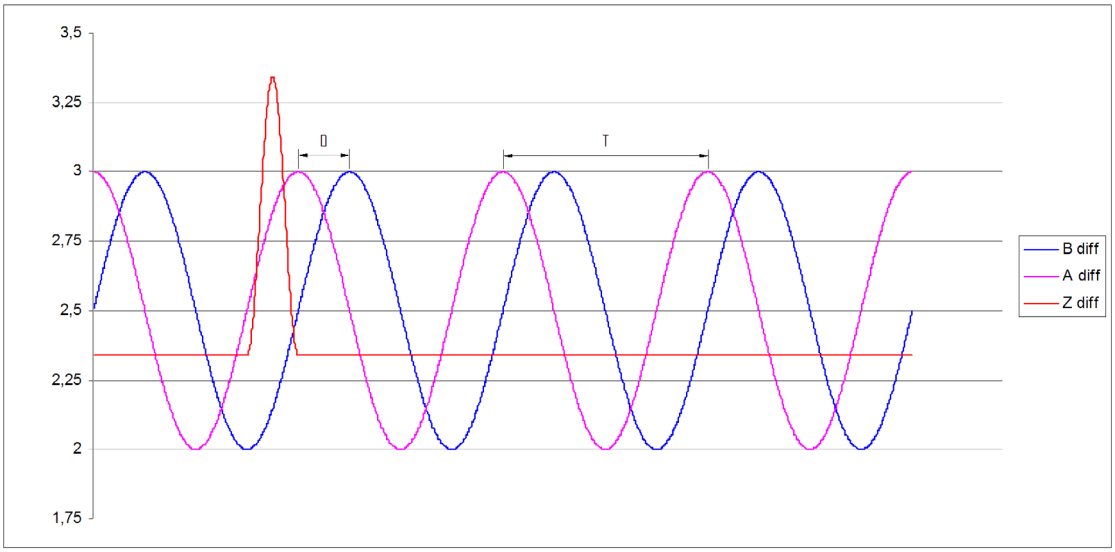
Displacement of signals A and B



Displacement of signals A and B negated

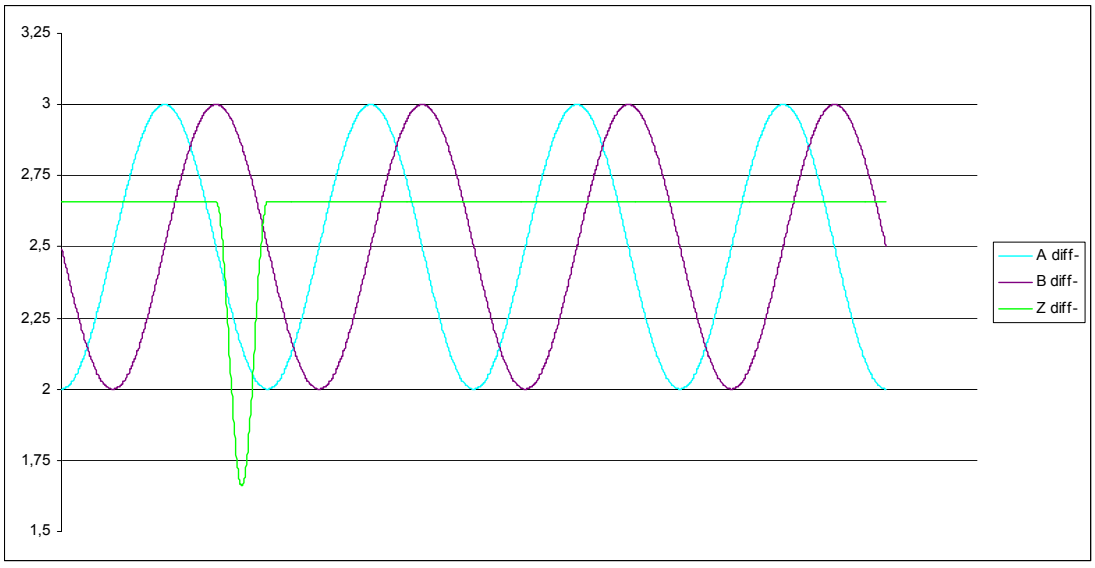


Temporal flow of differential signals:



T	Period
D	Phase displacement (D=T/4)
A diff.	(A) - (A-)
B diff.	(B) - (B-)
Z diff.	(Z) - (Z-)

Temporal flow of differential negated signals:



HSD S.p.A. © - 0106h00a.fm051112

7 Programmed maintenance

In order to be able to work in complete safety on an electrospindle installed on a machine, refer to the machine's instruction manual.

Fully complying with programmed maintenance is essential for maintaining the usage and operating conditions envisaged by the manufacturer at the moment the product is placed on the market.

The frequency was assessed considering a 5-day working week, 8 hours per day under normal working conditions.

Thoroughly read this section before carrying out any maintenance operations on the electrospindle.
The safety requirements to take into account during the various phases of maintenance work on the electrospindle are:

- the maintenance and/or lubrication operations must only be carried out by qualified skilled personnel, appropriately authorised by the technical management of the works and in accordance with current directives and standards, using equipment, tools and products suitable for the purpose.
- Suitable clothing must be worn when carrying out maintenance operations, such as close-fitting overalls and safety shoes, and avoiding at all costs loose clothing and that with protruding parts.
- During the various maintenance phases, it is advisable to delimit the machine and identify it with a sign indicating "MACHINE UNDER MAINTENANCE".

During all maintenance operations, make sure that the electrospindle:

- is disconnected from the electricity supply
- and that the tool is absolutely stationary (not rotating).

The maintenance manager must make use of a well co-ordinated team of personnel capable of guaranteeing the absolute safety of anyone exposed to possible hazardous situations. All personnel taking part in the maintenance operations must be in full visual contact with each other in order to be able to signal any dangers that may arise.

7.1 Daily maintenance

7.1.1 Control and cleaning of the tool holder seat and tool holder cone

The surfaces of contact between tool holder and tool holder seat must be kept clean to ensure a secure coupling.

At the beginning of the working day, make sure that the surfaces highlighted in the figures from 1 to 4 are clean, and free of dust, grease, coolant, oil, metal particles or machining waste, as well as free of traces of oxide or scale;
if necessary, **clean with a clean and soft cloth**.

Figure 1:
ISO tool holder

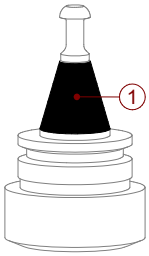
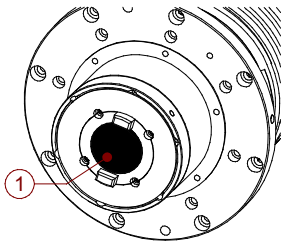


Figure 2:
ISO tool holder housing



(1) Conical surfaces (in black)

(2) Contact surfaces (in grey, HSK only)

Figure 3:
HSK tool holder

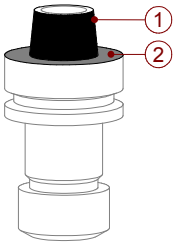
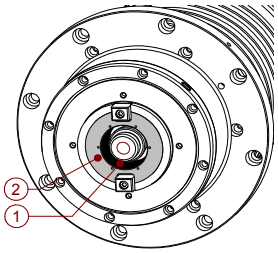


Figure 4:
HSK tool holder seat



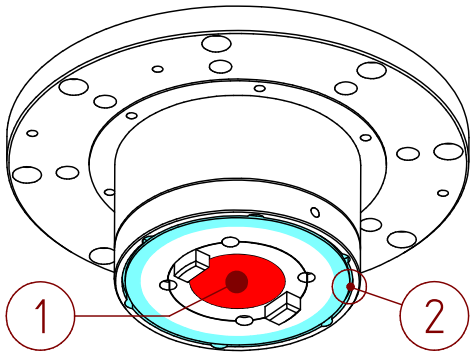
To clean the highlighted surfaces, use a soft clean cloth;
DO NOT use abrasive tools such as steel wool, metal brushes, emery cloth, acids or any other aggressive means.

At the end of the working day clean the surfaces highlighted in figures from 1 to 4 with a soft and clean cloth; imperfect cleaning can lead to serious consequences for the user's safety, the wear of the electrospindle and the tool holder, and the accuracy and efficiency of the machining operation.

HSD S.p.A. © - 0107h00a.fm051112

Never direct a jet of compressed air in the zone of the pressurised labyrinth seal, in that any infiltration would damage the interior of the electrospindle.

Do not direct a jet of compressed air inside the electrospindle when the tool holder is not coupled, as this could dirt the mating surface with the tool holder or cause machining residues to enter the electrospindle itself.



1	Coupling surface
2	Labyrinth seal

7.1.2 Protection of the tool holder seat

The tool holder seat must always be protected from the intrusion of impurities, which could soil, oxidise, or in any way degrade the contact surfaces: never leave the electrospindle without a tool holder cone inserted.

The cone used for protection must not have through holes.

To avoid sticking, remove the tool holder in the electrospindle both after any heavy work as well as at the end of the working day, and replace it with a clean tool holder at room temperature to protect the interior of the electrospindle from the external environment.

The tool holder to be removed may be hot! Use gloves!

7.2 Biweekly maintenance

7.2.1 Tool holder cone cleaning with alcohol

- For all versions:
  - Carefully clean the contact surfaces of the tool holders (shown in the figure 1 and 3) with a clean and soft cloth, moistened with ethyl alcohol;

7.3 Bearings

Do not touch the bearings as they are permanently lubricated with special high speed grease, and DO NOT NEED THE PERIODIC ADDITION OF GREASE.

HSD S.p.A. © - 0107h00a.fm051112

8 Replacing components

In order to be able to work in complete safety on an electrospindle installed on a machine, refer to the machine's instruction manual.

The electrospindle contains a spring that has been pre-loaded with a force of around one hundred kilograms. This spring is applied to a screw dowel that can be violently ejected if the electrospindle is dismantled by inadequately trained personnel.

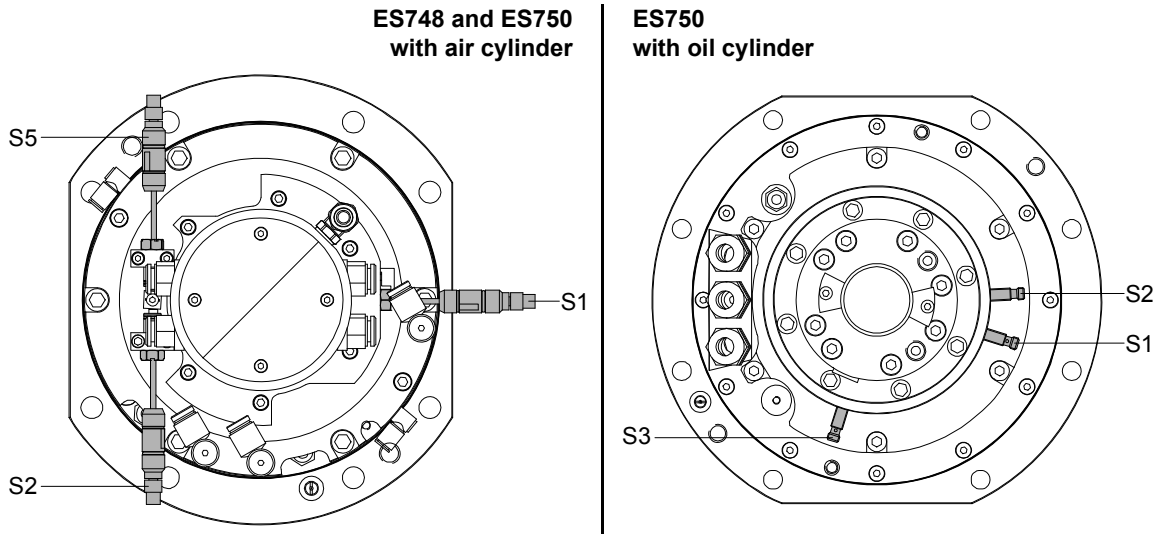
Only carry out the operations described in this manual. Follow the instructions scrupulously and in the case of doubt, contact the Manufacturer's Assistance Service.

Observe the maintenance safety instructions given on page 61.

Replacement and adjustment operation are only authorised with the original spare parts of the manufacturer described in this section of the manual.
Any other type of intervention is not allowed and will invalidate the warranty.

8.1 Replacement and adjustment of the sensor unit

8.1.1 Identification of the sensors

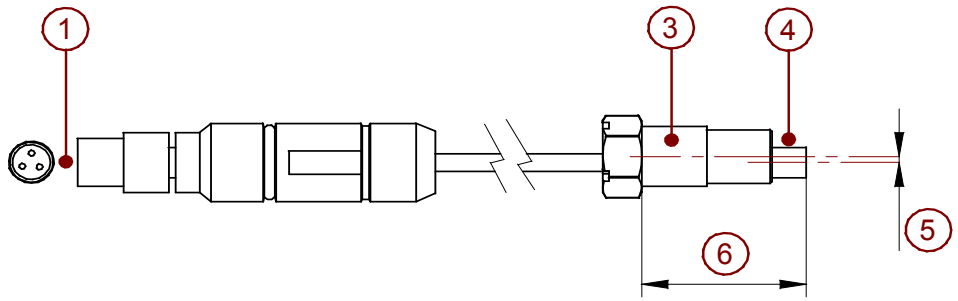


8.1.2 Description of the sensor unit

The sensors are pre-assembled in calibrated nuts to be easily inserted into the electrospindle at the correct depth. It is therefore important to correctly identify the sensor to be replaced: for this purpose, both the sensors installed on the electrospindle and those supplied as spares, are supplied with a numbered label (figure below).

The exchange of sensors damages moving parts.

Figure 5: Sensor unit ES748 and ES750 with air cylinder



HSD S.p.A. © - 0108h00a.fm051112

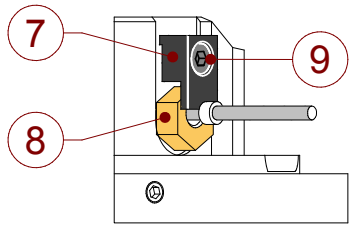


Figure 6: locking the sensor with brackets ES748 and ES750 with air cylinder

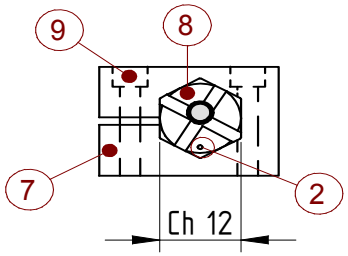
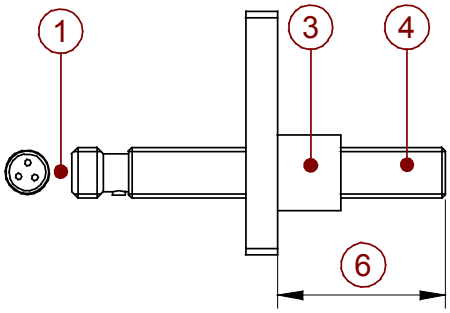


Figure 7: locking the sensor with a block ES748 and ES750 with air cylinder

Figure 8: Sensor unit ES750 with oil cylinder



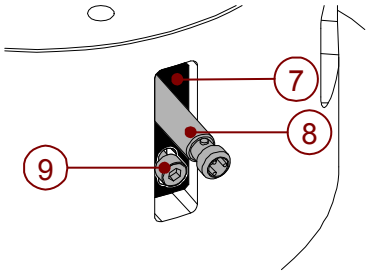


Figure 9: locking the sensor with bracket ES750 with oil cylinder

1	Electric connector	**6**	Calibrated position
2	Eccentricity marking	**7**	Bracket and block
3	Pre-inserted nut	**8**	Sensor unit
4	Sensor	**9**	Screw
5	Eccentricity between the nut and sensor, for adjustment		

8.1.3 Replacing and regulating the sensor group

For the replacement and adjustment of the sensors illustrated in this and subsequent paragraphs, refer to figures 5 and 6 or 8 and 9 of the previous paragraph.

5. remove the screw “9” that blocks the bracket or block “7” of the sensor unit “8” to replace;
6. remove the defective sensor unit from its seat, and disconnect its electrical connector “1”;
7. connect the electrical connector of the new sensor unit with the corresponding numbered connector on the spindle;
8. verify the functionality of the new sensor by placing the end in contact with a metal object;
9. insert the new sensor unit in the empty seat;

10. reposition the bracket “7” and tighten the screw “9” but not fully, so that the sensor unit can rotate;
11. rotate the sensor unit by a few degrees (or few mm) at a time, until the outputs required in the following paragraphs are obtained;
12. tighten the screw “9” holding the sensor unit with a fixed wrench, in order to keep the calibration performed.

8.1.4 Adjusting sensor S1

After having replaced the sensor unit as described in section 8.1.3, adjust it as follows:

1. do not fully tighten the sensor as careful adjustment must be performed;
2. attach the tool holder cone "S1 short" and check that the output of S1 is **"ON"**; if the output is **"OFF"** rotate the sensor unit until it turns to **"ON"**;
3. the sensor “4” is eccentric with respect to the nut “3” that holds it: slowly rotate the nut in the direction that moves the sensor away from the tool holder;
   stop as soon as the output of the sensor changes to **"OFF"**;
4. delicately turn the nut back by about 15° - 20°, so that the output of the sensor returns to **"ON"**;
5. manually turn the shaft and check that the signal remains **"ON"** for the entire rotation;
6. tighten the fixing screw “9”;
7. release the tool holder pressurising the piston at the value indicated in section 4.6 “ES748 and ES750 connections for air cylinder”, and check that in this condition (collet open) the S1 output is **“OFF”**;
8. remove the pressure from the piston and let the collet close without tool holder: in this condition the S1 output must be **“OFF”** for the entire rotation of the shaft;
9. if points (7) and (8) **are not verified**, repeat the procedure from the beginning, reducing the amplitude of the rotation performed at point (4);
10. if points (7) and (8) **are verified**, perform a cycle of 10 tool changes;
11. at the end of the cycle make sure the following table is met:

CONDITION	OUTPUT S1
tool holder blocked	**ON ***
no tool holder with collet closed	**OFF ***
collet open (tool holder ejected)	**OFF**

* for the entire rotation of the shaft

12. if the table **is not verified**, repeat the procedure from the beginning;

HSD S.p.A. © - 0108h00a.fm051112

13. if the table **is verified**, make the machine perform a cycle of 100 tool changes, using the largest possible number of different tool holders;
14. at the end of the cycle check that the table at point (11) is satisfied: **if so** the adjustment procedure of S1 is finished; **if not** repeat the procedure from the beginning.

8.1.5 Adjustment of sensor S2 for ISO models

After having replaced the sensor as described in paragraph 8.1.3, calibrate it as follows:

1. attach a tool holder properly before proceeding with the calibration of the sensor;
2. check that the output of S2 is **"OFF"**; if the output is **"ON"** rotate the sensor unit until it turns to **"OFF"**;
3. feed the cylinder by means of a unidirectional pressure regulator, set initially at 0 bar (0 PSI);
4. increase the feed pressure in increments of 0.1 bar (1.5 PSI), to slowly advance the piston, and at the same time check that the output of S2 is **“OFF”**;
5. as long as the tool holder is firmly blocked, the S2 output must be **"OFF"** ;
   if the output changes during the advance of the piston, rotate the sensor unit slightly until the output returns to **"OFF"**;
6. when the tool holder begins to loosen, but is not yet free to fall, the S2 output must still remain **"OFF"** (if necessary rotate the sensor unit);
7. when the supply pressure at which the tool holder is finally free to fall is reached, increase the pressure further by 0.2 bar (3 psi), and block the pressure regulator;
8. rotate the sensor unit so that in this condition the S2 output is **“ON”**;
9. perform a cycle of 10 tool changes;
10. at the end of the cycle check that steps (1) to (8) have been verified **without having to rotate the sensor**;
11. if the requested output **have not been** verified, repeat the entire procedure from the beginning;
12. if the requested output **are** verified, make the machine perform a cycle of 100 tool changes, using the largest possible number of different tool holders;
13. at the end of the cycle check that steps (1) to (8) have been verified **without having to rotate the sensor**;
14. if the requested output **have not been** verified, repeat the entire procedure from the beginning;
15. if the requested output **have** verified, the adjustment procedure of S2 is finished.

8.1.6 Adjustment of sensor S2 for HSK models

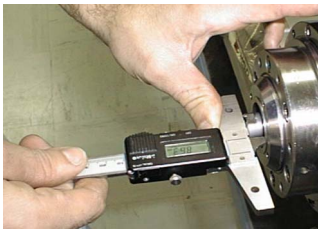


Figure 10:
ejector position

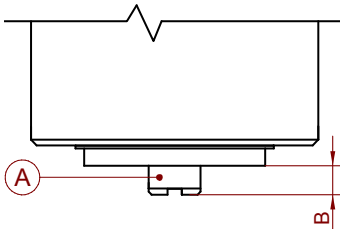


Figure 11:(A) ejector
(B) reference position

Table 1: (B) values	B1	B2
HSK E25	6.5	6,35
HSK E40/F50	8,5	8,35
HSK F63	10.5	10,3
HSK A63/B80	10.5	10,3

(+/- 0.1 mm)

After having replaced the sensor as described in paragraph 8.1.3, calibrate it as follows:

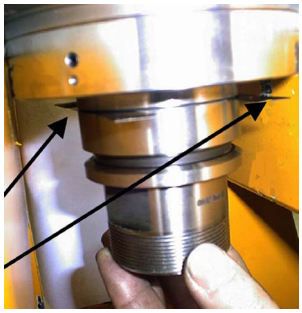
1. act on the cylinder to bring the spindle to a "collet open (tool holder ejected)" condition supplying it with the pressure indicated in paragraph 4.6 “ES748 and ES750 connections for air cylinder”; in these conditions, position B takes on the maximum value (figure 11);
2. as shown in both figures 10 and 11 check, with a depth gauge, that position (B) of the ejector, relating to the nose-spindle, assumes the “**B1**” value indicated in table 1;
   if not do not proceed further and contact the Assistance Service of the manufacturer;
3. discharge completely the cylinder's pressure;
   in these conditions, position B takes on the minimum value ;
4. feed the cylinder by means of a unidirectional pressure regulator, set initially at 0 bar (0 PSI);
5. increase the pressure with 0,1 bar steps (1,5 PSI), in order to make the ejector move slowly;
6. stop when position (B) reaches value “**B2**”;
7. if necessary loosen the screw “9” (Figure 6: “locking the sensor with brackets ES748 and ES750 with air cylinder”) relating to sensor S2;
8. turn the sensor S2 until the position in which the signal **"ON"** with (B) > **B2** and **"OFF"** with (B) < **B2** is found;
9. Fully tighten screw “9”.
10. perform a cycle of 10 tool changes;
11. at the end of the cycle check that point (8) is satisfied **without moving the sensor**;
12. **if necessary** move the sensor, then repeat the whole process from the beginning;
13. **if not necessary** move the sensor, then make the machine perform a cycle of 100 tool changes, using the largest possible number of different tool holders;
14. at the end of the cycle check that point (8) is satisfied **without moving the sensor**;
15. **if necessary** move the sensor, then repeat the whole process from the beginning;
16. **if it is not necessary** to move the sensor, then the S2 adjustment process is complete.

HSD S.p.A. © - 0108h00a.fm051112

8.1.7 Adjustment of the S4 sensor (only present in HSK models)

After having replaced the sensor as described in paragraph 8.1.3, calibrate it as follows:

1. put thickness spacers of 0.15 mm and 0.18 mm between the stop surfaces of the tool holder cone and the shaft-spindle, as shown in the figure below;
2. Insert and lock the tool holder cone in the spindle, then check that the signal from sensor S4 corresponds to that indicated in the following table:



CONDITION	SPACER INTRODUCED	OUTPUT S4
tool holder blocked	**0,15 mm**	**ON**
tool holder blocked	**0,18 mm**	**OFF**
collet open (tool holder ejected)		**OFF**

3. Rotate the shaft manually and check that the table is verified for the entire 360° rotation.
4. if not, rotate the sensor until the position necessary to obtain the output described in the table is found;
5. Fully tighten screw “9”.
6. perform a cycle of 10 tool changes;
7. at the end of the cycle, check that the table shown in point (2) has been satisfied for the entire 360° rotation of the shaft. Otherwise repeat the procedure from the start;
8. if the table is verified, make the machine perform a cycle of 100 tool changes, using the largest possible number of different tool holders;
9. at the end of the cycle, check that the table shown in point (2) has been satisfied for the entire 360° rotation of the shaft. Otherwise repeat the procedure from the start;

if the table in point (2) is satisfied, the calibration of S4 is complete.

8.1.8 Adjusting sensor S5

After having replaced the sensor as described in paragraph 8.1.3, calibrate it as follows:

1. attach a tool holder properly before proceeding with the calibration of the sensor;
2. supply 6 bar (87 PSI) to the cylinder to keep the piston at the upper limit switch
3. position the sensor in the highest position allowed by the movement (5) ("high" = opposite direction to the tool holder);
4. verify that in this condition the output of S5 is **“OFF”**;
5. slowly move the sensor downwards until the position needed for S5 output to be **“ON”** is found;
6. move the sensor a little further downwards;
7. lock the position of the sensor by tightening the screw “9”;
8. perform 10 "tool eject" - "back to upper limit switch" cycles;
9. move the piston to the upper limit switch
10. verify that in this condition the output of S5 is **“ON”**;
11. free the "piston at the upper end of stroke return air inlet" of the cylinder;
12. feed the tool holder expulsion air inlet of the cylinder by means of a unidirectional pressure regulator, set initially at 0 bar (0 PSI);
13. increase the supply pressure in increments of 0.1 bar (1.5 psi), and simultaneously turn the shaft by hand to check that it rotates freely and is not being held back by friction with the piston;
14. when the S5 output is **“OFF”**, the manual rotation of the shaft must still be completely free;
15. if the cylinder rubs against the shaft when the sensor S5 is **“ON”** , this means that the sensor has been advanced too much at the point [6] of this procedure: repeat the entire procedure, performing a finer advance at the point [6];
16. if point [14] of the procedure is satisfied, perform 50 "tool eject" - "return to upper end of stroke" cycles;
17. check the calibration by repeating steps from [9] to [16] of this procedure four times.

8.1.9 Adjustment of the sensors for ES750 with oil cylinder

Unlike the standard electrospindles, the sensors for version ES750 with oil cylinder, are fitted with a socket that allows them to be adjusted by moving along the spindle axis. The adjustment of both sensors S1 and S2 are performed the same way.

HSD S.p.A. © - 0108h00a.fm051112

8.1.10 Adjusting sensor S3

After having replaced the sensor unit as described in section 8.1.3, adjust it as follows:

1. do not fully tighten the sensor as careful adjustment must be performed;
2. attach the tool holder cone "S1 long" and check that the output of S3 is **“ON”**; if the output is **“OFF”** move the sensor unit towards the spindle's nose until it turns to **“ON”**;
3. move the socket in the tool-holder opposite direction and stop when the output is **”OFF”**;
4. delicately move forwards the socket by a few mm at a time so that the output of the sensor returns to **“ON”**;
5. manually turn the shaft and check that the signal remains **“ON”** for the entire rotation;
6. tighten the fixing screw “9”;
7. release the tool holder pressurising the piston at the value indicated in section 4.9 “Refrigerator”, and check that in this condition (collet open) the S1 output is **“OFF”**;
8. remove the pressure from the piston and let the collet close without tool holder: in this condition the S3 output must be **“ON”** for the entire rotation of the shaft;
9. if points (7) and (8) **are not verified**, repeat the procedure from the beginning, reducing the amplitude of the movement performed at point (4);
10. if points (7) and (8) **are verified**, perform a cycle of 10 tool changes;
11. at the end of the cycle make sure the following table is met:

CONDITION	OUTPUT S1
tool holder blocked	**ON ***
no tool holder with collet closed	**ON ***
collet open (tool holder ejected)	**OFF**

* for the entire rotation of the shaft

12. if the table **is not verified**, repeat the procedure from the beginning;
13. if the table **is verified**, make the machine perform a cycle of 100 tool changes, using the largest possible number of different tool holders;
14. at the end of the cycle check that the table at point (11) is satisfied: **if so** the adjustment procedure of S3 is finished; **if not** repeat the procedure from the beginning.

HSD S.p.A. © - 0108h00a.fm051112

9 Disposal of the product

The electrospindle contains a spring that has been pre-loaded with a force of around one hundred kilograms. This spring is applied to a screw dowel that can be violently ejected if the electrospindle is dismantled by inadequately trained personnel.

Only carry out the operations described in this manual. Follow the instructions scrupulously and in the case of doubt, contact the Manufacturer's Assistance Service.

At the end of the electrospindle's life cycle, it is the user's responsibility to dispose of it in the correct manner.
First of all, clean the various parts and then separate them into mechanical and electrical components. The different materials, such as electric motors (copper windings), metal components, plastic materials, etc. must be sorted and separated then disposed of in accordance with the laws applicable in the country of installation .

HSD S.p.A. © - 0109h00a.fm051112

10 Troubleshooting

⚠ **Before carrying out any operations on the electrospindle, read and implement all the warnings and recommendations regarding safety and maintenance.**

Problems	Cause	Remedy
The electrospindle does not rotate:	No power supply:	■ Check for the presence of mains voltage; ■ Check the connectors; ■ Check the integrity and continuity of the electrical connections.
	The tool holder is not inserted:	■ Insert a tool holder.
	The tool holder is not inserted correctly:	■ See item "The tool holder is not coupled" in this chapter.
	The thermal switch has tripped:	■ Wait for the electrospindle to cool down: the thermal switch will reset automatically to allow operation. If the thermal switch trips frequently, consult item "The electrospindle overheats" later in this chapter.
	The inverter protection has tripped:	■ Consult the manual or contact the manufacturer of the inverter.
	The series of S1 + S4 sensors is disconnected or faulty:	■ Check the connectors; ■ Check the integrity and continuity of the electrical connections; ■ Regulate the sensor as described in section 8.1 “Replacement and adjustment of the sensor unit”; ■ Replace the defective sensor as described in section 8.1 “Replacement and adjustment of the sensor unit”.
	Rotation denied:	■ Consult the manuals or the suppliers of the machine, the numerical control and the inverter that is connected to the electrospindle.

Problems	Cause	Remedy
The tool holder does not couple:	Foreign bodies between the tool holder and shaft-spindle:	■ Remove the macroscopic impurities and clean as described in section 7 “Programmed maintenance”.
	The tool holder cone is not the correct type:	■ Choose a tool holder according to the indications described in section 6.5 “Tool holder cone”.
	The collet does not open due to insufficient pressure:	■ Check the required pressure values in section 4.4 “Specifications for the compressed air supplied to the manufacturer's products”; ■ Check the integrity and efficiency of the pneumatic circuit.
	Sensor S2 is disconnected or faulty:	■ Check the connectors; ■ Check the integrity and continuity of the electrical connections; ■ Regulate the sensor as described in section 8.1 “Replacement and adjustment of the sensor unit”; ■ Replace the defective sensor as described in section 8.1 “Replacement and adjustment of the sensor unit”.
The tool holder does not eject:	Insufficient pressure:	■ Check the required pressure values in section 4.4 “Specifications for the compressed air supplied to the manufacturer's products”; ■ Check the integrity and efficiency of the pneumatic circuit.
No pressurisation:	Insufficient pressure or pneumatic circuit inefficient:	■ Check the required pressure values in section 4.4 “Specifications for the compressed air supplied to the manufacturer's products”; ■ Check the integrity and efficiency of the pneumatic circuit; ■ Contact the manufacturer's assistance service.
One of the sensors does not supply the required output:	Sensor disconnected or faulty:	■ Check the connectors; ■ Check the integrity and continuity of the electrical connections; ■ Regulate the sensor as described in section 8.1 “Replacement and adjustment of the sensor unit”; ■ Replace the defective sensor as described in section 8.1 “Replacement and adjustment of the sensor unit”.

HSD S.p.A. © - 0110h00a.fm051112

Problems	Cause	Remedy
The electrospindle overheats:	Insufficient cooling:	■ Check the specifications of the system at paragraph 4.9 “Refrigerator”; ■ Check the integrity and efficiency of the cooling circuit.
	Machining is too heavy:	■ Lighten the machining.
	The inverter parameters are incorrect:	■ Check the parameters on the plate of the electrospindle and in chapter 2 “Technical Specifications”, in the paragraphs related to the actual model.
Performance lower than specifications:	The inverter parameters are incorrect:	■ Check the parameters on the plate of the electrospindle and in chapter 2 “Technical Specifications”, in the paragraphs related to the actual model.
Electrospindle vibrates:	The tool holder is not balanced:	■ Choose a tool holder according to the indications described in section 6.5 “Tool holder cone”.
	The tool is not balanced:	■ Choose and use the tool as shown in section 6.6 “Tool”.
	Dirt between the tool holder cone and shaft-spindle:	■ Remove the macroscopic impurities and clean as described in section 7 “Programmed maintenance”.
	The inverter parameters are incorrect:	■ Check the parameters on the plate of the electrospindle and in chapter 2 “Technical Specifications”, in the paragraphs related to the actual model.
	Machining is too heavy:	■ Lighten the machining.
Electrospindle vibrates:	Fixing screws loose:	■ Tighten the fixing screws:
	Bearings damaged:	■ Contact the manufacturer's assistance service.
Bearings noisy:	Bearings damaged:	■ Contact the manufacturer's assistance service.

HSD S.p.A. © - 0110h00a.fm051112

11 List of spare parts

Manufacturer code	Description
H3811H1242	Calibration sensor gauges
H5664H0062	Inductive sensor (S1)
H5664H0063	Inductive sensor ES750 with oil cylinder
H5664H0040	Inductive sensor
2138A0547	Sensor plug connectors
2138A0548	Sensor plug connectors "90°"
2138A0326	17 pin female connectors (Encoder)

HSD S.p.A. © - 0112h00a.fm051112

12 Assistance

HSD S.p.A.

TECHNOLOGICAL EQUIPMENT FOR AUTOMATION

registered office:
Via della Meccanica, 16
61122 PESARO (ITALY)
Loc. Chiusa di Ginestreto
factory headquarters:
P.le Alfio De Simoni, sn
61122 PESARO (ITALY)
Tel. (+39) 0721.205.211
Fax (+39) 0721.205.247
E-mail **supporthsd@hsd.it**
www.hsd.it

HSD Deutschland GmbH

Brückenstrasse, 32
D-73037 Göppingen
Tel. +49(0)7161 956660
Fax +49(0)7161 9566610
E-mail **supporthsddeut@hsddeutschland.de**
www.hsddeutschland.de

HSD USA Inc.

3764 SW, 30th Avenue
33312 Fort Lauderdale, Florida USA
Phone no. (+1) 954 587 1991
Fax (+1) 954 587 8338
E-mail **supporthsdusa@hsd.it**
www.hsdusa.com

HSD Mechatronic Shangai Co. Ltd.

D2, First floor, 207 Taigu road
Waigaoqiao Free Trade Zone
200131, Shangai – China
Phone no. (+86) 215866 1236
E-mail sales@hsd-china.cn
www.hsd-china.cn

HSD S.p.A. © - 0113h00a.fm051112

13 Declaration of incorporation

HSD MECHATRONIC DIVISION

DICHIARAZIONE D'INCORPORAZIONE
DECLARATION OF INCORPORATION
EINBAUERKLÄRUNG
DÉCLARATION D'INCORPORATION
DECLARACIÓN DE INCORPORACIÓN

CE

IL FABBRICANTE / THE MANUFACTURER / DER HERSTELLER / LE FABRICANT / EL FABRICANT:

HSD S.p.A. *registered office:* via Della Meccanica, 16 - 61122 Pesaro (PU) Italy
factory headquarters: p.le Alfio De Simoni, s/n - 61122 Pesaro (PU) Italy
Tel.: (+39) 0721 205 211 - Fax: (+39) 0721 205 247

DICHIARA CHE LA QUASI- MACCHINA (2006/42/CE ALLEGATO IIB) / DECLARE THAT THE PARTLY COMPLETED MACHINE (2006/42/EEC ANNEXE IIB) / ERKLÄRT, DASS DIE UNVOLLSTÄNDIGE MASCHINE (2006/42/EG ANLAGE IIB) / DÉCLARE QUE LA QUASI-MACHINE (2006/42/CE ANNEXE IIB) / DECLARA QUE LA CASI MÁQUINA (2006/42/CE ADJUNTO IIB):

Electrospindle
Marble - Glass series

Matricola / Serial Number / Seriennummer / Numéro de série / Número de serie:

Codice HSD / HSD Code / Code HSD / Code HSD / Código HSD:

Codice Cliente / Customer Code / Kunden-Code / Code client / Código del cliente:

I

- RISPETTA I REQUISITI ESSENZIALI APPLICATI (2006/42/CE ALLEGATO I):
  1.1.5 - 1.3.2 - 1.3.4 - 1.3.6 - 1.5.01 – 1.5.08 – 1.5.09 – 1.5.10 – 1.5.11 – 1.7.1 - 1.7.3 – 1.7.4 – 1.7.4.1 – 1.7.4.2 - 1.7.4.3
- IL FABBRICANTE SI IMPEGNA A TRASMETTERE, IN RISPOSTA A D UNA RICHIESTA ADEGUATAMENTE MOTIVATA DALLE AUTORITÀ NAZIONALI, INFORMAZIONI PERTINENTI LA QUASI MACCHINA.
  PERSONA AUTORIZZATA A COSTITUIRE LA DOCUMENTAZIONE TECNICA PERTINENTE:
  NOME E COGNOME: GIUSEPPE GROSSO - INDIRIZZO: P.LE ALFIO DE SIMONI, SN – 61122 – PESARO (ITALY)

IL FABBRICANTE VIETA LA MESSA IN SERVIZIO FINCHÉ LA MACCHINA FINALE IN CUI DEVE ESSERE INCORPORATA NON E STATA DICHIARATA CONFORME SE DEL CASO ALLE DISPOSIZIONI DELLA PRESENTE DIRETTIVA.

GB

- COMPLIES WITH THE FOLLOWING APPLICABLE ESSENTIAL REQUIREMENTS (2006/42/EEC ANNEXE I):
  1.1.5 - 1.3.2 - 1.3.4 - 1.3.6 - 1.5.01 – 1.5.08 – 1.5.09 – 1.5.10 – 1.5.11 – 1.7.1 - 1.7.3 – 1.7.4 – 1.7.4.1 – 1.7.4.2 - 1.7.4.3
- THE MANUFACTURER UNDERTAKES TO TRANSMIT, IN RESPONSE TO A REASONED REQUEST BY THE NATIONAL AUTHORITIES, RELEVANT INFORMATION ON THE PARTLY COMPLETED MACHINERY.
  PERSON AUTHORISED TO COMPILE THE RELEVANT TECHNICAL DOCUMENTATION:
  NAME AND SURNAME: GIUSEPPE GROSSO - ADDRESS: P.LE ALFIO DE SIMONI, SN – 61122 – PESARO (ITALY)

THE MANUFACTURER STATES THAT THE PARTLY COMPLETED MACHINERY MUST NOT BE PUT INTO SERVICE UNTIL THE FINAL MACHINERY INTO WHICH IT IS TO BE INCORPORATED HAS BEEN DECLARED IN CONFORMITY WITH THE PROVISIONS OF THIS DIRECTIVE, WHERE APPROPRIATE.

D

- DEN FOLGENDEN WESENTLICHEN ANFORDERUNGEN ENTSPRICHT (2006/42/EG ANLAGE I):
  1.1.5 - 1.3.2 - 1.3.4 - 1.3.6 - 1.5.01 – 1.5.08 – 1.5.09 – 1.5.10 – 1.5.11 – 1.7.1 - 1.7.3 – 1.7.4 – 1.7.4.1 – 1.7.4.2 - 1.7.4.3
- DER HERSTELLER VERPFLICHTET SICH, DIE SPEZIELLEN UNTERLAGEN ZUR UNVOLLSTÄNDIGEN MASCHINE EINZELSTAATLICHEN STELLEN AUF VERLANGEN ZU ÜBERMITTELN.
  FÜR DIE AUSSTELLUNG DER TECHNISCHEN DOKUMENTATION BERECHTIGTE PERSON:
  VOR- UND NACHNAME: GIUSEPPE GROSSO - ANSCHRIFT: P.LE ALFIO DE SIMONI, SN – 61122 – PESARO (ITALY)

DIE UNVOLLSTÄNDIGE MASCHINE DARF ERST DANN IN BETRIEB GENOMMEN WERDEN, WENN FESTGESTELLT WURDE, DASS DIE MASCHINE, IN DIE DIE UNVOLLSTÄNDIGE MASCHINE EINGEBAUT WERDEN SOLL, DEN BESTIMMUNGEN DER VORLIEGENDEN RICHTLINIE ENTSPRICHT.

F

- EST CONFORME AUX CRITÈRES ESSENTIELS APPLIQUÉS (2006/42/EG ANNEXE I):
  1.1.5 - 1.3.2 - 1.3.4 - 1.3.6 - 1.5.01 – 1.5.08 – 1.5.09 – 1.5.10 – 1.5.11 – 1.7.1 - 1.7.3 – 1.7.4 – 1.7.4.1 – 1.7.4.2 - 1.7.4.3
- LE FABRICANT S'ENGAGE, EN RÉPONSE À UNE DEMANDE ADÉQUATEMENT MOTIVÉE DES AUTORITÉS NATIONALES, À LEUR TRANSMETTRE DES INFORMATIONS CONCERNANT LA QUASI-MACHINE.
  PERSONNE AUTORISÉE À CONSTITUER LA DOCUMENTATION TECHNIQUE PERTINENTE:
  PRÉNOM ET NOM: GIUSEPPE GROSSO - ADRESSE: P.LE ALFIO DE SIMONI, SN – 61122 – PESARO (ITALY)

LE FABRICANT INTERDIT LA MISE EN SERVICE TANT QUE LA MACHINE FINALE DANS LAQUELLE ELLE DOIT ÊTRE INCORPORÉE N'AURA PAS ÉTÉ DÉCLARÉE CONFORME, LE CAS ÉCHÉANT, AUX DISPOSITIONS DE LA PRÉSENTE DIRECTIVE.

E

- RESPETA LOS SIGUIENTES REQUISITOS ESENCIALES APLICADOS (2006/42/EG ADJUNTO I):
  1.1.5 - 1.3.2 - 1.3.4 - 1.3.6 - 1.5.01 – 1.5.08 – 1.5.09 – 1.5.10 – 1.5.11 – 1.7.1 - 1.7.3 – 1.7.4 – 1.7.4.1 – 1.7.4.2 - 1.7.4.3
- EL FABRICANTE SE COMPROMETE A TRANSMITIR, COMO RESPUESTA A UNA SOLICITUD ADECUADAMENTE MOTIVADA DE LAS AUTORIDADES NACIONALES, INFORMACIONES REFERENTES A LA CASI-MÁQUINA.
  PERSONA AUTORIZADA A CONSTITUIR LA DOCUMENTACIÓN TÉCNICA PERTINENTE:
  NOMBRE Y APELLIDO: GIUSEPPE GROSSO - DIRECCIÓN: P.LE ALFIO DE SIMONI, SN – 61122 – PESARO (ITALY)

EL FABRICANTE PROHIBE LA PUESTA EN SERVICIO HASTA QUE LA MÁQUINA FINAL EN LA CUAL DEBE SER INCORPORADA NO HAYA SIDO DECLARADA CONFORME, SI ES EL CASO, A LAS DISPOSICIONES DE LA PRESENTE DIRECTIVA.

Data / Date / Datum / Date / Fecha:
Pesaro, 25/03/2010

Procuratore Speciale
Special Attorney
Sonderbevollmächtiger
Fondé de pouvoir extraordinaire
Mandatario Especial

FABRIZIO PIERINI

M-SQ006 Rev. 09 25/03/2010

HSD
MECHATRONIC
DIVISION

HSD S.p.A.
Sede legale:
Via della Meccanica, 16
61122 Pesaro (PU) Italy
Tel. +39 0721 439100
Fax +39 0721 439150

Sede centrale:
P.le A.De Simoni, sn
61122 PESARO (ITALIA)
Tel. +39 0721 205 211
Fax +39 0721 205 247
E-mail supporthsd@hsd.it
web www.hsd.it